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PENSOFT

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Taxonomy and nomenclature of some Fennoscandian Sawflies, with descriptions of two new species (Hymenoptera, Symphyta)

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Abstract

While working on an identification guide to the sawflies of Fennoscandia, we encountered numerous taxonomic problems, for some of which we present solutions. *Dicrostema* Benson, 1952 is a new synonym of *Phymatoceropsis* Rohwer, 1916, and not congeneric with *Paracharactus* MacGillivray, 1908. Two species occurring in Europe are transferred to *Phymatoceropsis*. *Dolerus aericepsellus* Heidemaa and Mutanen **sp. nov.** and *Heptamelus viitasaarii* Liston, Mutanen and Prous **sp. nov.** are described from Finland. *Abia brevicornis* Leach, 1817 **nom. rev.** is the valid name of *Abia nitens* auct. nec Linnaeus, and *Abia nitens* (Linnaeus, 1758) is the valid name for what has recently been called *Abia sericea* (Linnaeus, 1767). *Tenthredo haemorrhoidalis* Fabricius, 1781 is treated as an unplaced species of Hymenoptera, possibly Ichneumonoidea. *Calameuta variabilis* (Mocsáry, 1886) is the valid name of the species recently generally called *C. haemorrhoidalis*. *Claremontia confusa* (Konow, 1886) **sp. rev.** and *Claremontia brevicornis* (Brischke, 1883) are distinct species. *Dolerus coracinus* (Klug, 1818) is the valid name for *D. anthracinus* auct. *Dolerus anthracinus* (Klug, 1818) is a valid species similar to *D. nitens* Zaddach, 1859. *Dolerus coruscans* Konow, 1890 **sp. rev.** is a valid species. *Dolerus junci* (Stephens, 1835) is the valid name for *Dolerus cothurnatus* auct. *Dolerus timidus* (Klug, 1818) **sp. rev.** is distinguished from the similar *D. pratensis* (Linnaeus, 1758). A neotype is designated for *Astatus punctatus* Klug, 1803. Lectotypes are designated for 39 nominal species. 29 species group names are new junior synonyms. We present data on some species recently collected for the first time in Finland, including first records for the Palaearctic and West Palaearctic.

Key Words

Cephidae, Cimbicidae, Diprionidae, distribution, Heptamelidae, nomenclature, Palaearctic, Pamphiliidae, taxonomy, Tenthredinidae

Introduction

Viitasaari (2002a) presented an informative introduction to the Symphyta, with a strong focus on the northern European fauna. Useful keys exist for many of the smaller families occurring in Fennoscandia, such as the Siricoidea, Orussoidea and Cephoidea (Viitasaari 1984), Diprionidae (Viitasaari and Varama 1987), Argidae, Blasticotomidae and Cimbicidae (Viitasaari 1990), Pamphiliidae (Viitasaari 2002b) and Xyelidae (Blank et al. 2013). Regularly updated online databases, covering all sawfly species so far recorded there, are available for Sweden

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(ArtDatabanken 2022) and Finland (Finnish Biodiversity Information Facility 2022). However, up-to-date, comprehensive identification works covering the Fennoscandian Tenthredinidae, by far the largest symphytan family in Europe, are still lacking. The online database ECatSym (Taeger et al. 2018) is useful for finding specialised literature on the taxonomy of smaller groups and individual taxa.

In 2021, Marko Mutanen initiated a project to compile a book which will enable, as far as possible, the identification of all Fennoscandian sawflies. For practical reasons, the geographic area covered by the book will include not only the strictly Fennoscandian territories of Norway, Sweden, Finland, Russian Karelia, and the Russian districts of Murmansk and Leningrad, but also Estonia. During preliminary assessment of the identity of species occurring in these territories, we encountered several taxonomic and nomenclatural problems. The solution of these entails the modification of circumscriptions of numerous species names, and in one case the names of genera. To avoid the need for lengthy explanations in the book, we here describe some of these problems, and offer remedies. Most of the studied species occur extensively outside Fennoscandia, and our results should accordingly be of wider interest. The taxonomic results are explained in short sections, in alphabetical order of the initial letter of the taxon under discussion. Lastly, data is presented for several species recently detected for the first time in Fennoscandia.

Material and methods

Abbreviations for collections

ANSP	Academy of Natural Sciences of Drexel University, Philadelphia, USA
BMNH	The Natural History Museum [formerly British Museum (Natural History)], London, United Kingdom
CEH	private collection of Erik Heibo, Lierskogen, Norway
CEJ	private collection of Ewald Jansen, Leipzig, Germany
CNC	Canadian National Collection of Insects, Ottawa, Canada
CTN	Collection of Thierry Noblecourt, Quillan, France
HNHM	Hungarian Natural History Museum, Budapest, Hungary
LSUK	Linnean Society, London, United Kingdom
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MZAT	Museum Zoologicum Åbo Academi, Turku, Finland
MZH	Finnish Museum of Natural History, Helsinki, Finland
MZLU	Lunds universitet, Entomology Collection, Lund, Sweden
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden
RBINS	Royal Belgian Institute of Natural Sciences, Brussels, Belgium
RMNH	Nationaal Natuurhistorische Museum („Naturalis"), Leiden, Netherlands
SDEI	Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany
VVT	private collection of Veli Vikberg, Turenki, Finland
ZIN	Russian Academy of Sciences, Zoological Institute, St. Petersburg, Russia
ZMHB	Naturkundemuseum, Berlin, Germany
ZMUC	University of Copenhagen, Zoological Museum, København [= Copenhagen], Denmark
ZMUN	University of Oslo, Zoological Museum, Oslo, Norway
ZMUO	Zoological Museum, University of Oulu, Finland
ZSM	Zoologische Staatssammlung, München [= Munich], Germany

Codes in the formats DEI-GISHym[..] and ZMUO.[..] given after the number and sex of examined specimens are unique identifiers used respectively by the SDEI and the ZMUO. The codes used for specimens in the MZH are sometimes in the form of web addresses, which generally link to images of the specimen, but are shortened when we use them to refer to, for example, figures. Descriptions of labelling, unless stated otherwise, refer to handwritten labels on pale paper.

Morphological terminology and measurement conventions follow Viitasaari (2002a), except for the word "pit", as used by Goulet (1992) instead of the traditional, but less appropriate, "puncture". In most cases, genitalia preparations were made using the techniques described by Viitasaari (2002a) and temporarily mounted in glycerol on microscope slides for examination and photography. The detached parts were subsequently glued to a card and pinned with the specimen.

For species delimitation, one mitochondrial and two nuclear gene fragments were sequenced. The mitochondrial fragment is cytochrome c oxidase subunit I (COI) and the nuclear fragments are sodium/potassium-transporting ATPase subunit alpha (NaK) and DNA dependent RNA polymerase II subunit RPB1 (POL2). DNA was sequenced using Sanger (see Prous et al. 2019) or Oxford Nanopore technologies (see Prous et al. 2021). For some of the sequences reported here, the Nanopore sequencing protocol differed from Prous et al. (2021). Briefly, PCR products of different specimens were tagged with unique molecular barcodes using a Native Barcoding Expansion 96 EXP-NBD196 kit, then pooled to add sequencing adapters using a Ligation Sequencing Kit (SQK-LSK109) and sequenced with a R10.3 flow cell. Raw data was basecalled with Guppy v6.0.1 in super accuracy mode, which also sorts individual reads to different folders corresponding to different specimens based on the unique

molecular tags. Reads of different genes were identified with BLAST 2.9.0+ (https://www.ncbi.nlm.nih.gov/books/NBK279690/). Initial consensus sequences were created based on 100 random reads of each gene using MAFFT v7.427 (Katoh and Standley 2013) together with EMBOSS cons v6.6.0.0 (http://emboss.open-bio.org/rel/dev/apps/cons.html) and abPOA 1.0.4 (https://github.com/yangao07/abPOA). Medaka v1.4.1 (https://github.com/nanoporetech/medaka) was used to polish the initial consensus sequences and resolve different variants. Additionally, many COI sequences (DNA barcodes) were generated in the Centre for Biodiversity Genomics, Guelph, Canada using both Sanger and SEQUEL platforms (deWaard et al. 2008; Hebert et al. 2018). The COI sequence of the *Heptamelus dahlbomi* male was extracted from the sequence capture dataset (ultraconserved elements or UCEs) obtained for another study (Wutke et al.: unpublished). To extract the COI region, we first downloaded all available COI sequences of sawflies from the NCBI GenBank to build a local BLAST reference database. We then used the blastn algorithm to filter out the previously assembled contigs that matched the reference database. These contigs were then aligned using MAFFT (Katoh and Standley 2013) implemented in Geneious Prime v2021.1 (Biomatters Ltd) and the consensus sequence was used for further analyses. The newly obtained DNA sequences have been submitted to NCBI GenBank (accessions OM852106–OM852305, OM888660, OM901157–OM901165). Additional sequences were obtained from GenBank or BOLD (http://www.boldsystems.org/). Maximum likelihood trees were built with IQ-TREE 1.6.12 (http://www.iqtree.org/) (Nguyen et al. 2015) and genetic p-distances (proportion of nucleotide differences) were calculated in R with the package *ape* (Paradis and Schliep 2019). An intron of POL2 was excluded from phylogenetic analyses of the Blennocampinae and Allantinae dataset, but retained in the *Pristiphora carinata* group dataset because of the lack of insertions or deletions. In comparing COI barcode sequences using analysis tools provided by BOLD systems (Ratnasingham and Hebert 2013) we sometimes refer to BINs (Barcode Index Numbers: see Ratnasingham and Hebert 2013).

Occurrence data of the relevant sequenced specimens is provided as a supplementary table: https://doi.org/10.3897/dez.@@.84080.suppl1

Images were taken with SEMs, and a variety of cameras, sometimes through microscopes. Their quality is correspondingly variable.

Results

The taxonomy of *Abia nitens* (Linnaeus, 1758) and *A. sericea* (Linnaeus, 1767) (Cimbicidae)

Linnaeus (1758) described *Tenthredo nitens* very briefly [translated from Latin]: "antennae clubbed, yellow; abdomen glabrous blue. Inhabits Europe. Dorsum of abdomen with oblong black marking extending over four segments". The last character identifies the specimen as a male. Linnaeus' description fits five European *Abia* species occurring in Europe, namely those treated by Taeger (1998) under the names *A. candens* Konow, 1887 (Konow 1887b), *A. fulgens* Zaddach, 1863, *A. nitens*, *A. spissicornis* Konow, 1902, and *A. sericea* (Linnaeus, 1767). Later, Linnaeus published two modified descriptions of *Tenthredo nitens*. These differ significantly from each other, and from the original description. In the Fauna Suecica (Linnaeus 1761), he included the characters "Tibiae flava. Maris abdomen supra longitudinaliter nigricans antennis ferrugineis, nec ut in femina nigris". The description of the male thus agrees with the original description, but the description of the black antennae of the female indicates that he had before him a different species of *Abia*, such as *A. aenea* or *A. mutica*. Thomson (1871) pointed out this mistake. Linnaeus (1767) again re-described *T. nitens*, this time omitting a mention of sexual dimorphism in antenna color, and stating "Pedes lutei". Possibly he had realized that his previous 1761 description was partly based on the "wrong" female. In the same work, *Tenthredo sericea* was characterized as having "[..]antennis clavatis luteis[..]Pedes testacei Femoribus nigris". These later re-descriptions have been the cause of much confusion. Indeed, Linnaeus' (1767) characterizations are congruent with the most recent characterizations of *Abia nitens* auct. and *A. sericea* auct. (Taeger 1998). Malaise and Benson (1934) wrote about the two specimens under the name *T. nitens* in the LSUK: "1 ♂, *Abia nitens* L., auct., labelled 'nitens', agrees with the description and is no doubt the type. 1♀ labelled 'Herman No. 2, 1787', also belongs to the same species". The male specimen was thus designated by Malaise and Benson (1934) as the lectotype of *Tenthredo nitens*. Images of the lectotype (LINN 2402) in dorsal and lateral view are available (The Linnean Society of London 2022). The image in lateral view shows that the lectotype has mostly black femora, with only the apices pale. The lectotype of *T. nitens* therefore does not belong to the species which has recently been called *Abia nitens*, which always has predominantly pale femora with only at most the basal fifth black. The entirely pale antennae of the lectotype of *T. nitens*, in conjunction with its mostly dark femora, identify it as what has in recent decades been called *Abia sericea* (Linnaeus, 1767) [rather than *A. candens* or *A. fulgens*, which both have parts of the antenna dark]. The decision by Malaise and Benson (1934) to designate LINN 2402 as the lectotype of *T. nitens* was undoubtedly correct, but their failure to draw the nomenclatural conclusions which necessarily follow from this is difficult to explain, because accurate characterizations of both *A. nitens* auct. and *A. sericea* auct. had been available for many years, for example by Enslin (1917). Very regrettably, we now have to accept that the valid name for *Abia nitens* auct. is *Abia brevicornis* Leach, 1817, and the valid name for what has recently been called *Abia sericea* is *A. nitens*. The taxonomic and nomenclatural changes, summarized:

Abia brevicornis Leach, 1817, nom. rev.

Abia brevicornis Leach, 1817: 114. Sex not stated [but probably female, because conspicuous dark dorsal patches on abdomen are not mentioned]. Syntypes (assumed). Type locality: not stated. Type material probably lost or destroyed.

Cimbex splendida Klug, 1820 [incorrect original spelling]: 98–99. ♀, ♂. Syntypes. Type locality: Germany; rare in this area [around Berlin]. Syntype ♂ [examined]: "GBIF-GISHym2903", "13567", "Germania", "nitens L. Soldanski det.". ZMHB.

Abia rossica Semenov, 1896: 159, 167–168. ♀. Holotype [not examined]. Type locality: Ukraine, Kamjanez-Podilskyj.

Abia nitens auct. nec Linnaeus. Misidentification of *Tenthredo nitens* by, for example: de Dalla Torre (1894), Konow (1905b), Taeger (1998), Liston and Späth (2006).

Notes. Taeger et al. (2010) also listed *Abia nitens* var. *vernetensis* Pic, 1928 (type locality: France, Allier) as a junior synonym of *Abia nitens* auct. However, no type specimen has been examined subsequent to its description, as far as we are aware. Pic wrote [translated from French] "differs from the typical form in the black-marked base of the posterior femora". This suggests that it possibly does not belong to *A. brevicornis*.

Abia nitens (Linnaeus, 1758)

Tenthredo nitens Linnaeus, 1758: 556. ♂ [because the conspicuous dark dorsal patches on abdomen are mentioned]. Syntypes (assumed). Type locality: Europe. Lectotype designated by Malaise and Benson (1934). LSUK. Images of the lectotype (LINN 2402) in dorsal and lateral view are available (The Linnean Society of London 2022).

Tenthredo sericea Linnaeus, 1767: 921. Sex not stated [but probably female, because dark dorsal patches on abdomen are not mentioned]. Syntypes (assumed). Type locality: Leipzig. syn. nov.

Abia sericea: de Dalla Torre (1894), Konow (1905b), Enslin (1917), Liston and Späth (2006), Taeger et al. (2010).

Abia dorsalis Costa, 1859: 5–6. ♀. Holotype [not examined]. Type locality: Italy, Cape Miseno near Naples. syn. nov.

Notes. *Abia nitens* was successively mentioned as occurring in Sweden by Fallén (1807), Dahlbom (1836), and Thomson (1871), who all placed *Tenthredo sericea* as its synonym. Thomson's description of leg color indicates that he had before him specimens of the species called by Taeger (1998) *A. sericea*, or perhaps *A. candens* [not distinguished from the former in Thomson's time]. Influenced by the continued, widespread use of the name *Abia nitens* in Scandinavian literature, Taeger et al. (2006) and ArtDatabanken (2015) included Sweden within the range of *A. brevicornis* [as *A. nitens* auct.]. In fact, no Swedish specimens of *A. brevicornis* have been located in the MZLU or NHRS collections, and there are no published records from other Fennoscandian countries. *Abia brevicornis* is restricted to extremely dry, summer-warm sites, where its larval hosts occur (*Scabiosa* spp.) (Liston and Späth 2006). Probably it has a strongly continental distribution: its most north-westerly known localities in Europe are in Central Germany, whereas it is not definitely known in France (Noblecourt 2020), and a single old record from Spain needs confirmation. Although a presence of *A. brevicornis* in southern Sweden cannot be ruled out, we consider it likely that all references to *A. nitens* auct. in Sweden relate to either *A. nitens* [= *sericea*] or *A. candens*.

The taxonomy of *Allantus basalis* (Klug, 1818) in northern Europe (Tenthredinidae, Allantinae)

Fig. 1

Allantus basalis (Klug, 1818) is one of the many species of the subgenus *Emphytus* Klug, 1818 that feeds chiefly on roses (*Rosa* spp.). However, according to Vershutskij (1981), in Siberia *A. basalis* is associated mainly with *Betula*, and less so with *Rosa* spp. and *Dasiphora fruticosa*. Whether he was dealing with the same taxon identified as *A. basalis* in Europe is unclear. The nominal subspecies *A. basalis basalis*, widely distributed in Europe and evidently feeding on roses (e.g. Stein 1929; Kontuniemi 1960), is easily distinguished from close relatives by its black hind tibiae and tarsi (Benson 1945). Based on one male and three female specimens, Benson (1945) described *A. basalis caledonicus* from Scotland, which differs from the nominal subspecies by the reddish-brown hind tibiae of the female and brown tibiae of the male. Reddish coloration of tibiae and tarsi is characteristic of several other species of *Allantus* (*Emphytus*), but Benson (1945) associated *A. caledonicus* with *A. basalis* using other morphological structures. He also illustrated the male genitalia of *A. caledonicus* showing clear differences to those of *A. cinctus* (Linne, 1758), *A. coryli* (Stritt, 1937) and *A. cingulatus* (Scopoli, 1763). Benson later stated that *A. caledonicus* occurs not only in Scotland, but also in northern Scandinavia (Benson 1952). This seems plausible, because Hellén (1948) observed apparent intergrades between two "color forms" in Finland. Indeed, we also observed that *A. basalis* specimens collected on roses in Finland typically have predominantly brown rather than black tibiae and tarsi (as in Fig. 1A, B). As Benson stated that only males of *A. caledonicus* have brown-marked (not reddish) metatibiae, females with brown metatibiae (and not reddish or black) found in Finland could indeed be held to be intermediate.

Liston (1985) determined the two females and four male specimens of *A. basalis* that he swept from roses in two localities in Scotland as the nominal subspecies and not *A. caledonicus*, based on their leg coloration. This observation suggests that these forms may be sympatric, but both Benson (1945) and Liston (1985) stated that the food plant of *A. caledonicus* remains unknown.

The authors have collected many *A. basalis* from roses from several localities in Finland, including on *Rosa majalis* in two locations in Kuusamo, eastern Finland.

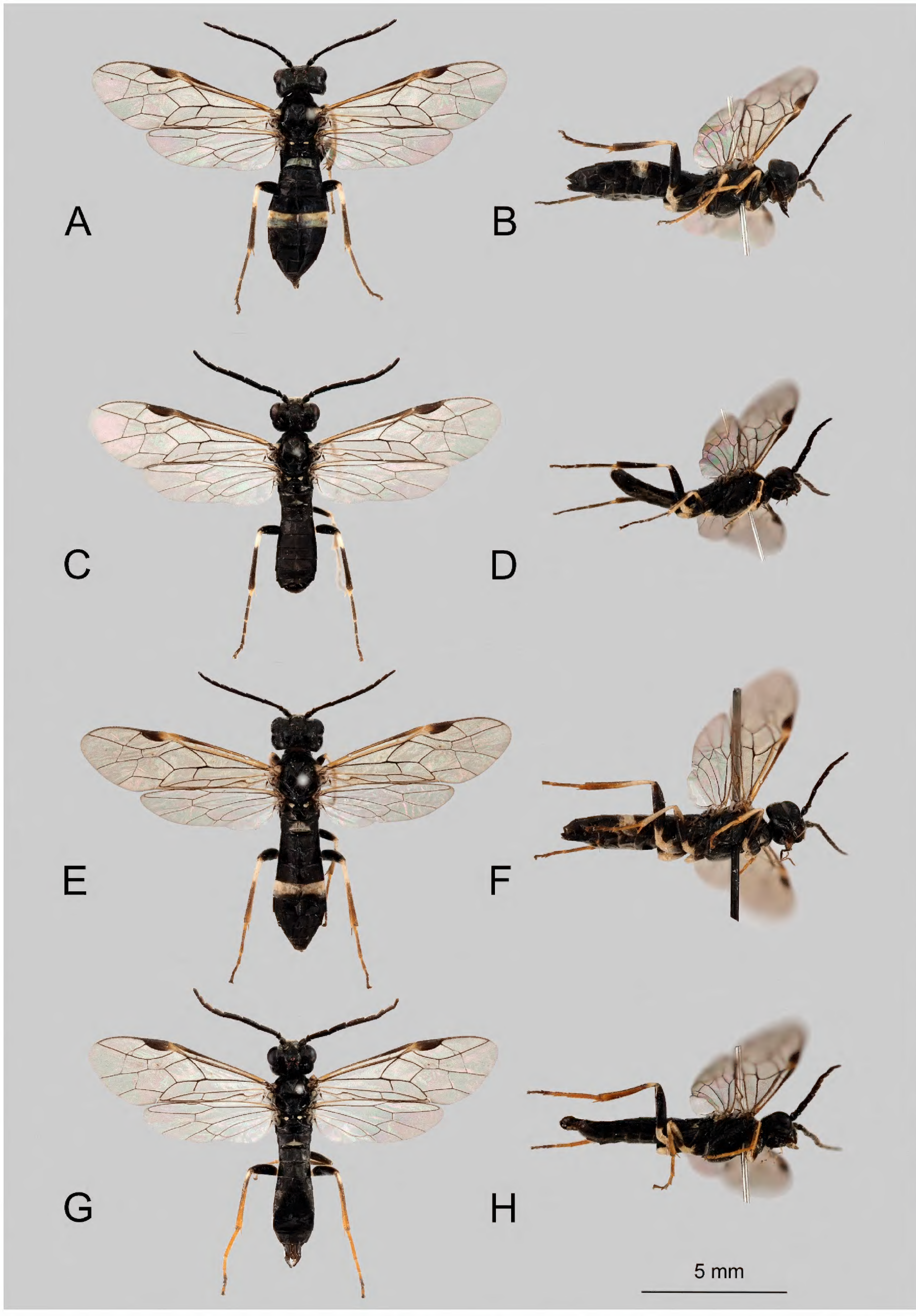

Figure 1. A–D. *Allantus basalis basalis* (Klug, 1818); **A**. Dorsal habitus ♀ (ZMUO.044185); **B**. Ventrolateral habitus (ZMUO.044185); **C**. Dorsal habitus ♂ (ZMUO.035409); **D**. Ventrolateral habitus (ZMUO.035409); **E–H**. *Allantus basalis caledonicus* Benson, 1945; **E**. Dorsal habitus ♀ (ZMUO.031257); **F**. Ventrolateral habitus (ZMUO.031257); **G**. Dorsal habitus ♂ (ZMUO.045347); **H**. Ventrolateral habitus (ZMUO.045347).

Those specimens all have nearly black or dark brown markings on the hind legs (like Fig. 1A–D). In 2020, M. Mutanen collected three male specimens of *Allantus* from another locality in Kuusamo: a shady, limestone-affected, creekside forest with rich vegetation, where no or only few roses occur, but *Rubus saxatilis* is abundant. Due to the strongly reddish color on the hind legs (Fig. 1G, H), these specimens were initially identified as *A. cingulatus*, a species not reported from Finland. Later, we re-examined them because the pronotum is not edged with pale, and the clypeus and tegulae are not entirely pale, as typically in *A. cingulatus*. Finally, we concluded that the other characters fit *A. basalis*. It is worth noting that Benson's single male of *A. caledonicus* had brown, not reddish-marked hind legs.

In addition to the three males from Kuusamo, we have examined three females and one male of *A. basalis* collected with a Malaise trap by Ali Karhu from a peat bog area in Liperi, eastern Finland. Each of these specimens has reddish brown-marked hind legs (Fig. 1E, F). No roses occur at the locality, but there is plenty of *Rubus chamaemorus*. Furthermore, Guy Söderman (in litt.) informed us of a male specimen from Paltamo, central Finland, with reddish-marked hind legs. We have not examined this specimen, but he also keyed it to *A. cingulatus*.

So far, all the specimens with reddish-marked hind legs have been collected from localities where roses are unlikely to be host plants. At the same time, all specimens that we have collected from localities with roses in the same geographic region have the hind legs marked with black or dark brown. We find this hardly coincidental, and agree with Blank and Taeger (1998) that *A. caledonicus* might represent a distinct species. Blank and Taeger (1998) observed also that the male genitalia depicted by Benson (1945) do not agree with those of the holotype of *A. basalis*. For this reason, and as we find the entire group to need a thorough revision, we refrain from taking any taxonomic action in this connection, but document our observations on *A. basalis* in the hope that this will assist during future revisionary work on *Emphytus*.

The taxonomy of an undetermined species near *Athalia cordata* Serville, 1823 (Tenthredinidae, Athaliinae)

Fig. 2

There are three BINs for specimens identified as *Athalia cordata*: BOLD:ACH2693, BOLD:AAP1621, and BOLD:ACB1972. The distance between BOLD:ACH2693 and BOLD:AAP1621 is small, 1.7%–1.8%, but BOLD:ACB1972 diverges from the others by 6.5–7.0%. BOLD:ACB1972 (specimens from Norway and Finland, Fig. 2A–C) is closest to *A. kashmirensis* Benson, 1932 (BOLD:ACA1217) and *A. yanoi* Takeuchi, 1952 (BOLD:AEA4024), species not reported in Europe (divergence 2.4–3.0%). The lancet of one specimen (ZMUO.028057) belonging to BOLD:ACB1972 is shown in Fig. 2C, and the lancet of DEI-GISHym20310 (BOLD:AAP1621) in Fig. 2D. There is clearly a large difference in the shape of their serrulae. In external morphology, including color pattern, specimens in each of

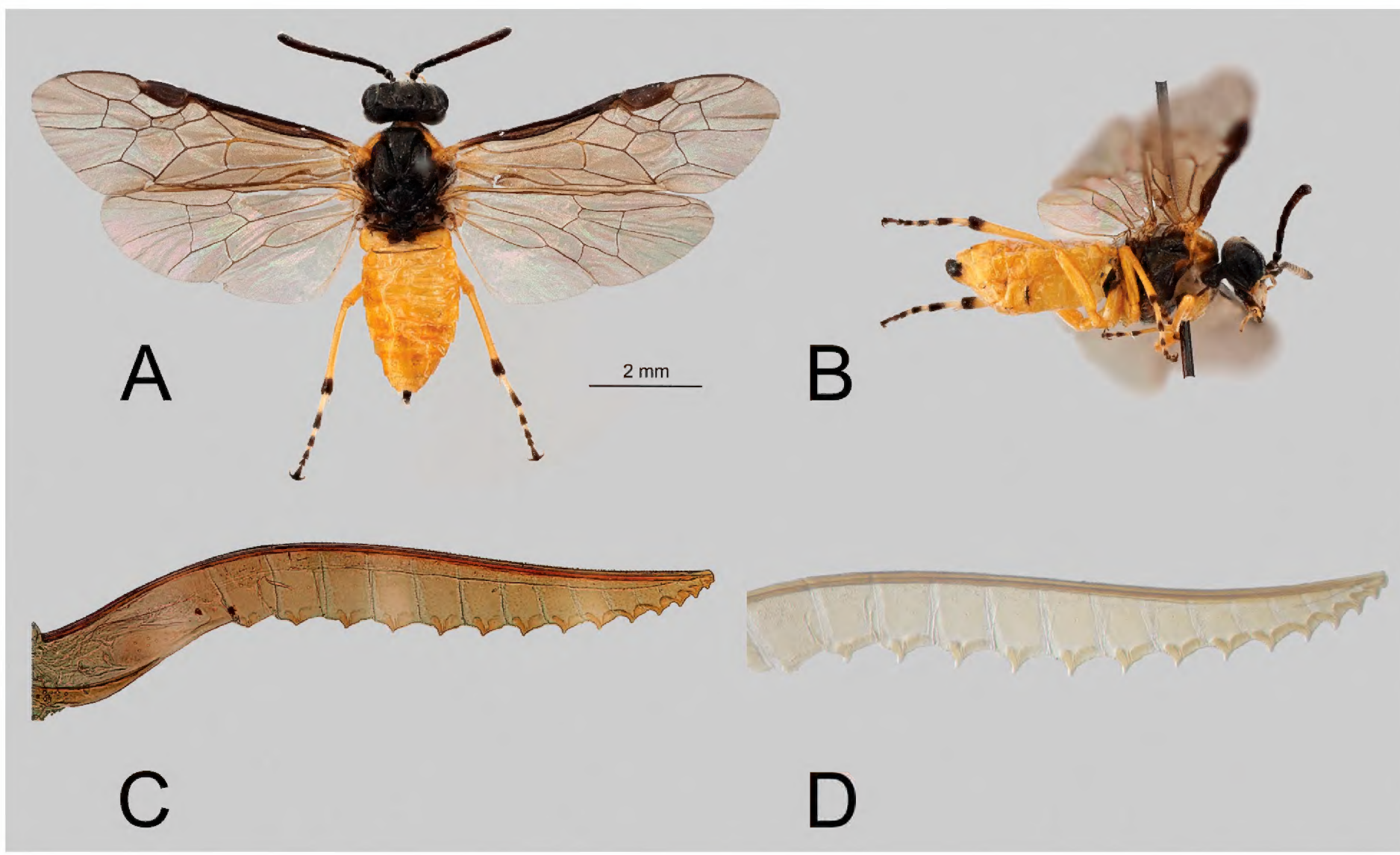

Figure 2. *Athalia* sp. near *cordata* ♀. **A.** Dorsal habitus (ZMUO.028058); **B.** Ventrolateral habitus (ZMUO.028058); **C.** Lancet (ZMUO.028057); **D.** *Athalia cordata* Serville, 1823 ♀, lancet (DEI-GISHym20310).

these BINs do not seem to differ from each other. Of described West Palaearctic *Athalia* species, *A. chevini* Lacourt, 1986 (type locality: French Alps) is the closest morphologically to the unidentified Norwegian and Finnish specimens. However, it seems premature to identify them as this species, because the drawing of serrulae of *A. chevini* in Lacourt (1986) indicates differences which may be significant. Gene sequence data for *A. chevini*, currently not available, might help to decide whether or not they are conspecific.

The taxonomy of two *Calameuta* species (Cephidae)

Tenthredo haemorrhoidalis Fabricius, 1781 and *Astatus punctatus* Klug, 1803 were both described from specimens collected in Germany. The species names have been in recent use for two similarly colored species of *Calameuta* Konow, 1896 (Konow 1896a). The type material of both *T. haemorrhoidalis* and *A. punctatus* is considered to be lost or destroyed. Most authors up to and including de Dalla Torre (1894) used these species names for two different species of *Cephus*. Konow (1905a) considered them to be conspecific and placed them in *Calameuta*. Gussakovskij (1935), who again placed them in *Cephus*, was apparently the first to notice morphological characters which clearly distinguish these two species, but he followed Konow (1905a) in regarding *Cephus haemorrhoidalis* and *C. punctatus* [*Calameuta punctata*] as synonyms, and described the second taxon as new to science under the name *Cephus filum*. More recent specialists, who since Benson (1946) have placed the species in *Calameuta*, continued to recognize these two species as distinct, and have generally used the name *C. haemorrhoidalis* for one, and *C. punctata* or *C. filum* for the other. Taeger et al. (2010) listed *C. haemorrhoidalis*, *C. punctata* and *C. filum* each as a valid species of *Calameuta*. Examination of specimens recently collected in Germany led to investigation of the taxonomy and nomenclature of several nominal species occurring in Europe that have evidently been partly wrongly interpreted. By designating primary types for two of the most important of these names, we seek to clarify the previously confused taxonomy of the species and promote nomenclatural stability. Furthermore, a critical re-evaluation of the original description of *Tenthredo haemorrhoidalis* led us to a novel conclusion about its identity.

Tenthredo haemorrhoidalis Fabricius, 1781: 417. ♀. Syntypes (assumed). The type material is considered to be lost or destroyed. Published type locality: "Germania". New placement: Hymenoptera (Ichneumonoidea?) species incertae sedis

"Dom. de Hattorff", mentioned in the original description (Fabricius 1781), refers to one of the "Herren von Hattorf", a noble family residing in Hattorf am Harz (ca. 51.65°N, 10.24°E). In contrast to some other taxa for which the collector's name "Dom. de Hattorff" is given in the original description, S. M. Blank did not find types of *T. haemorrhoidalis* in the ZMUC in 2008. Neither were extant specimens mentioned by Klug (1819) in his work on sawflies in the Fabricius' collection, nor by Zimsen (1964).

The original description reads: "59. T[enthredo]. antennis setaceis atra, ano pedibusque testaceis. Habitat in Germania. *Dom. de Hattorff.* Corpus paruum atrum. Antennae setaceae, nigrae longitudine corporis. Abdomen atrum ano rufo. Pedes testacei femoribus basi nigris." [Translated:] "antennae setaceous, black; legs and tip of abdomen pale-brown. *Mr von Hattorff.* The body is small and dark. Antennae setaceous, black, as long as the body. Abdomen black with red anus. Legs pale brown, base of femora black."

At least two of these characters do not fit *Calameuta punctata* (or *C. variabilis*), in which the antennae are not even nearly as long as the abdomen, and the legs are largely black, with only the pro- and mesofemora apically pale. Furthermore, Fabricius placed *T. haemorrhoidalis* between other taxa which have a body length approximately close to that of *Calameuta punctata*, but of these species, only *T. haemorrhoidalis* is described as being small. We suggest that it is likely that *Tenthredo haemorrhoidalis* Fabricius represents a species of Ichneumonoidea, and that the name should no longer be applied to any symphytan species.

Calameuta punctata (Klug, 1803)

Figs 3–4

Astatus punctatus Klug, 1803: 55, plate VII figs 2a, b. ♀. Syntypes (assumed). The type material is considered to be lost or destroyed. Published type locality: Germany [implicit from title of Klug's work]. Neotype designated below.

Calameuta punctata: Zombori (1978).

Astatus floralis Klug, 1803: 53–54, plate VI figs 5a, b. ♂. Syntypes (assumed). The type material is considered to be lost or destroyed. Published type locality: Germany [implicit from title of Klug's work]. syn. nov.

Astatus analis Klug, 1803: 54–55, plate VII fig. 1. ♀. Syntypes (assumed). The type material is considered to be lost or destroyed. Published type locality: Germany [implicit from title of Klug's work]. syn. nov.

Cephus filum Gussakovskij, 1935: 112, 358, 361. ♀, ♂. Syntypes. Type locality: Sarepta, Caucasus, and southern Siberia. ZIN. syn. nov.

Calameuta filum: Benson (1946).

Type material examined and taxonomic notes. To help resolve the taxonomic disagreements in the interpretation of these nominal taxa, and promote the future stability of nomenclature, a neotype is designated for *Astatus punctatus*:

Astatus punctatus Klug, 1803. Neotype ♀ (DEI-GISHym21255, Fig. 4A–D), hereby designated. Germany, Brandenburg, Landkreis Märkisch-Oderland, Müncheberg, Trebnitz, 52.535°N, 14.204°E, damp meadow, swept from *Alopecurus pratensis*, 16.05.2015, leg. A.

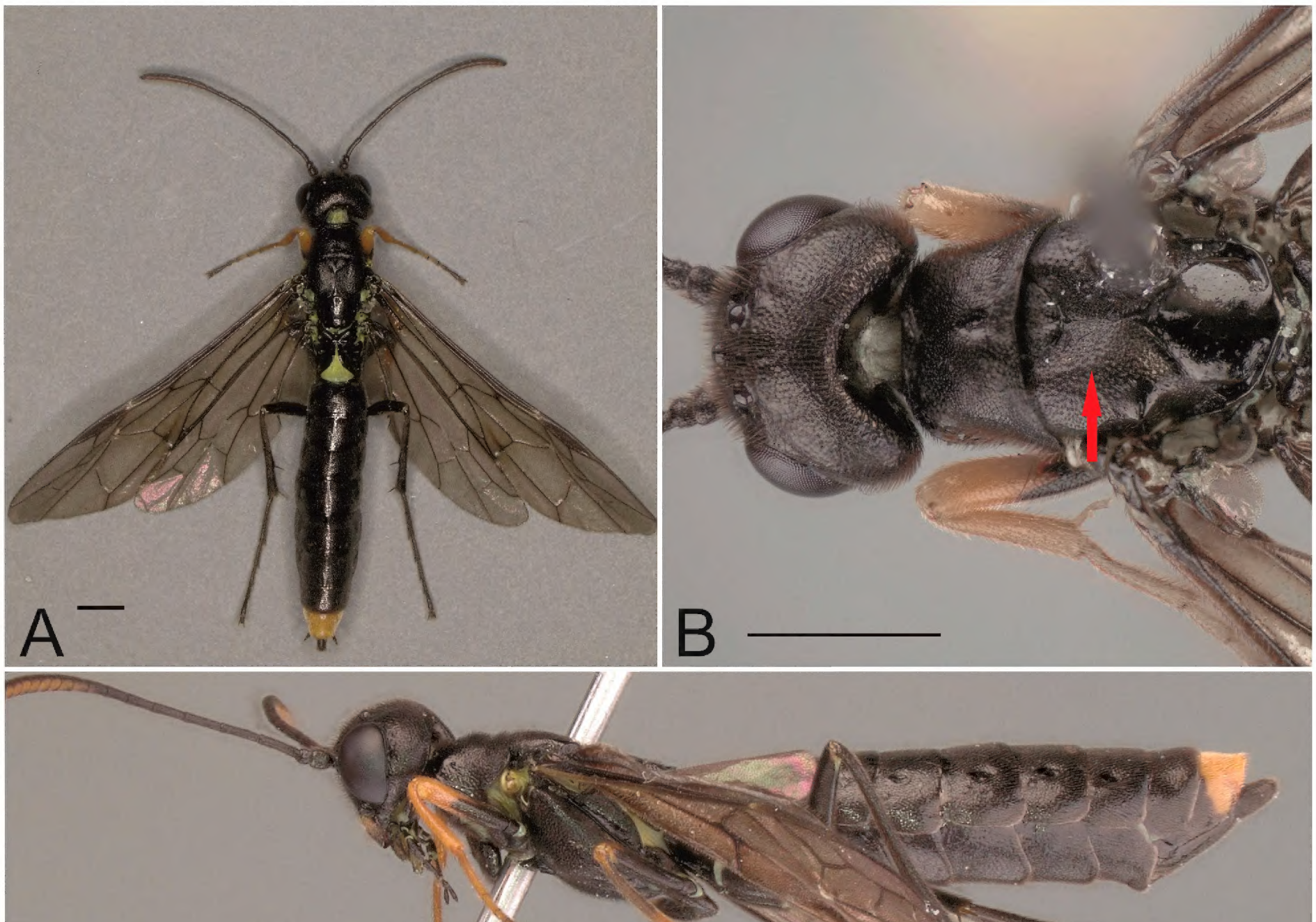

Figure 3. *Calameuta punctata* (Klug, 1803) ♀ (DEI-GISHym12236). **A.** Dorsal habitus; **B.** Head and thorax, dorsal. Mesoscutum (arrow); **C.** Lateral habitus; **D.** Maxillary palp. Palpomeres 5 and 6 (arrows); **E.** Head and thorax, ventral. Scale bars: 1 mm.

Liston (deposited in the SDEI). Labelling [printed on pale paper if not stated otherwise]: "Germany: Brandenburg; Landkreis Märkisch-Oderland, Müncheberg Trebnitz 16.05.2015 leg. A. D. Liston", "21255" [handwritten] with part of a leg gummed to card], "DEI-GISHym21255", "♀ Calameuta punctata (Klug) [handwritten] det. A. Liston 2018", "NEOTYPE ♀ Astatus punctatus Klug, 1803 designated A. Liston 2022" [red]. Klug's description states that abdominal segment 4 has obscure, paired dorsal spots; segment 5 four separate yellow spots, one pair laterally, the other dorsally; segments 6 and 7 with spots on their lower posterior margins; segment 8 immaculate; segment 9 completely yellow. Accordingly, we selected as neotype a specimen with small pale markings on terga 4–7 as well as 8–10 (Fig. 4A–D). The abdomen of a second female (DEI-GISHym21260) collected at the same place and time

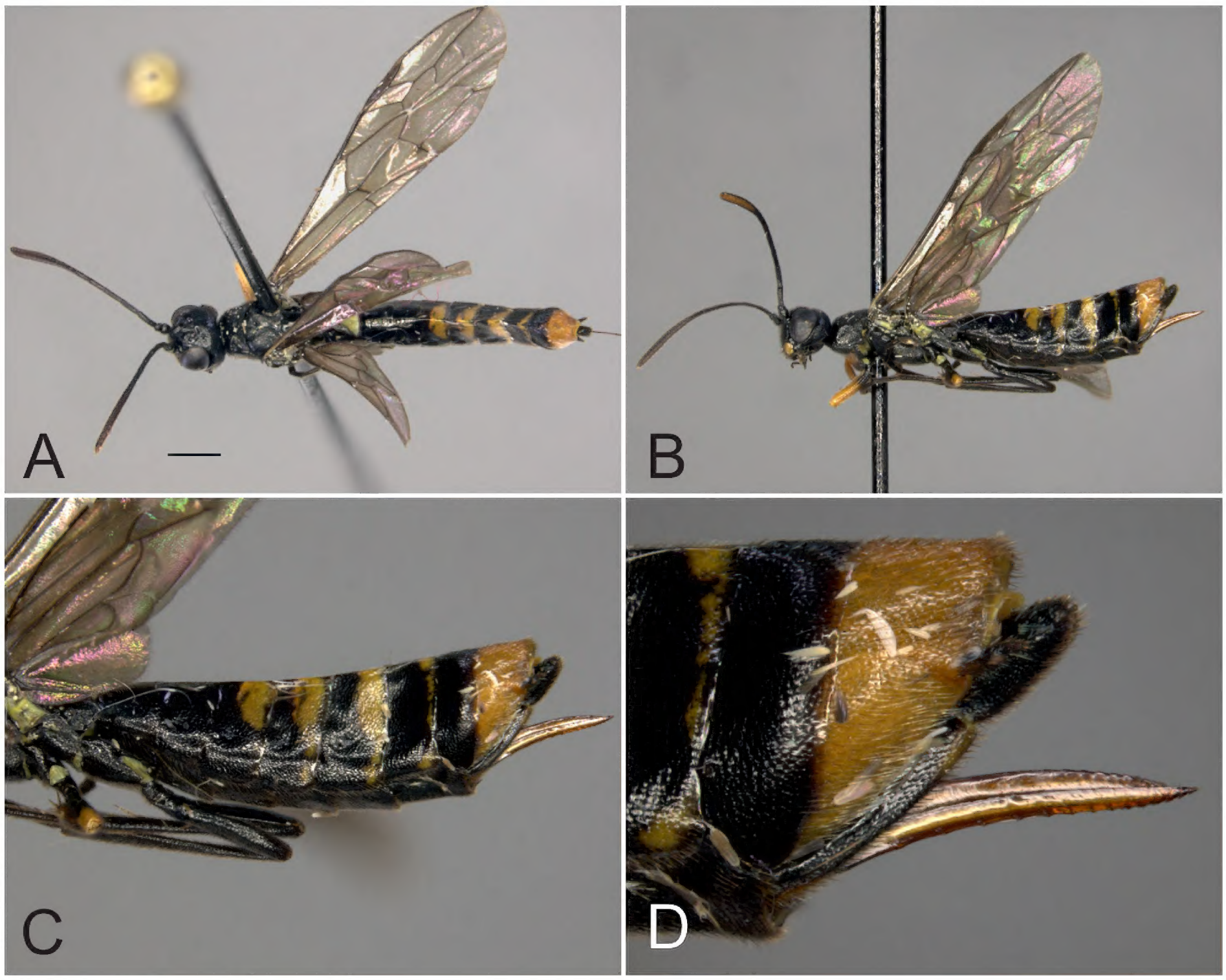

Figure 4. *Calameuta punctata* (Klug, 1803): neotype ♀ *Astatus punctatus* Klug, 1803 (DEI-GISHym21255). **A.** Dorsal habitus; **B.** Lateral habitus; **C.** Abdomen, lateral; **D.** Abdomen tip, lateral. Scale bar: 1 mm.

has fewer and less extensive pale markings and is thus intermediate in this respect to other female *C. punctata* specimens collected in Germany and all known Finnish and Estonian specimens, which have a completely black abdomen apart from terga 8–10 (Fig. 3A, C).

Astatus floralis and *A. analis* have in the past generally been treated as synonyms of *Calameuta haemorrhoidalis* auct. [our *variabilis*], e.g. by Konow (1905a). The opinion that *A. floralis* is a synonym of *Cephus pygmeus* (Linnaeus, 1767), as in de Dalla Torre (1894), cannot be accepted: Klug's description of leg colour does not fit *C. pygmeus*. Our reason for placing *A. floralis* and *A. analis* as synonyms of *Calameuta punctata* rather than of *C. variabilis* is based primarily on one of the main characters which distinguishes *C. punctata* from *C. variabilis*: the structure of the maxillary palps. In the description of *Astatus* which precedes the descriptions of *A. floralis*, *A. analis* and *A. punctatus*, Klug characterized the genus thus: "Palpi[...]anteriores[...] sexarticulati, articulis duobus baseos cylindricis, aequalibus, tertio crassiori, longiori, subcylindrico, quarto longissimo, graciliori, quinto brevissimo, ultimo longitudine fere tertii subulato[...]". The described proportions of maxillary palpomeres 5 and 6 therefore fit *C. punctata* (Fig. 3D), not *C. variabilis* (Fig. 5B). *Calameuta variabilis* is unique in *Calameuta* in having maxillary palpomeres 5 and 6 of almost equal length (Gussakovskij 1935; Benson 1968; Zombori 1978). Zombori (1978) correctly identified *Calameuta variabilis* [which he called *C. haemorrhoidalis*] as a taxon distinct from *C. punctata*, and summarized the characters that distinguish them, but interpreted some of the names wrongly. Notably, Zombori (1978) did not mention the major contradiction in the morphology of the maxillary palps, as described by Klug, when he tentatively suggested that *A. floralis* and *A. analis* might be synonyms of *haemorrhoidalis* auct. ["the description of the latter two [*floralis*, *analis*] rather corresponds to the one given by Fabricius for *C. haemorrhoidalis*, accordingly, they are considered as synonyms of the latter name."]. Zombori's main reason for doubting that *analis* was synonymous with *punctata*, seems to have been the wording of Klug's descriptions, which suggested that the thorax of *analis* is shinier than that of *punctata*. Apart from this, Klug's description of *A. analis* fits the darker forms within the rather wide range of variability in the female sex of *C. punctata*. Strangely, in his discussion of these names, Zombori (1978) does not mention *Calameuta filum* at all.

The explicit collection data given by Klug (1803) for *Astatus floralis* ("Locus in editioribus argillosis; in floribus"), *A. analis* ("Locus in editioribus; in floribus"), and *A. punctatus* ("Locus in floribus") are, in part, not easy to interpret. Clearly, "in floribus" means that the specimens were collected from flowers. We think that "in editioribus argillosis" refers simply to the type of locality, i.e. an elevated place on clayey ground. This fits well with the type of sites at which *C. punctata* has recently been collected in Germany (see below).

The synonymy of *Calameuta filum* with *C. punctata* can be proposed with a high degree of confidence. The characters described by Gussakovskij (1935) for the former are precisely those used by Zombori (1978) to characterize the latter. The same characters are also given by Viitasaari (1975) in his description of Finnish specimens identified as *Calameuta filum*, and which he compared with a syntype of that species. Viitasaari (1984) subsequently noted that *Calameuta punctata* sensu Zombori (1978) and *C. filum* are probably conspecific.

Biology and distribution. The only recorded host plant of *Calameuta punctata* is *Alopecurus pratensis* L. (Vikberg 1978; Liston 2015), on which it is possibly monophagous. Accordingly, *C. punctata* occurs mostly in rather moist places. Its wider geographic range is not entirely clear, particularly because the identity of *Calameuta pravei* (Dovnar-Zapolskij, 1926) remains unresolved. This has been considered to be a valid species (e.g. Llorente and Gayubo 1990), or a synonym of *C. punctata* (e.g. Taeger et al. 2010). *Calameuta pravei* was recorded by Gussakovskij (1935) from Transcaucasia, Crimea, and the western Kopet-Dagh (Turkmenia). Llorente and Gayubo (1990) added records from Spain. Excluding these records, *C. punctata* is known from south-east Russia, Transcaucasia and south Siberia to Irkutsk (Gussakovskij 1935, as *Cephus filum*), and central and northern Europe (specimens examined by us). The distribution of *C. punctata* is therefore rather different from that of *C. variabilis* (see below), but their ranges overlap at least in parts of south-central Europe.

Calameuta variabilis [as *C. haemorrhoidalis* auct.] has been stated to occur in Germany based on the mention of Germany as the type locality in the original descriptions by Fabricius (1781) of *Tenthredo haemorrhoidalis* and by Klug (1803) of *Astatus punctatus*, *A. floralis* and *A. analis*, coupled to an apparently faulty understanding of which taxa are represented by these names. Blank et al. (1998, 2001) listed *C. haemorrhoidalis* from Germany, only for Berlin-Brandenburg, dating the record respectively as "vor 1803" and "1802". This refers to the type material of Klug's species. Later, Liston et al. (2012) treated *C. haemorrhoidalis* auct. [*C. variabilis*] as extinct in Germany, and added *C. punctata* to the German list, based on recently collected specimens. Although it cannot be ruled out that *C. variabilis* once occurred in Germany, but has since disappeared, we think it more likely that in historical times only *C. punctata* ever occurred there, and propose in future to include only it in the list of German Symphyta. Fennoscandian and Estonian specimens which were previously identified as *C. filum* also belong to *C. punctata*.

Based on COI sequences, *C. punctata* is split into two barcode clusters. Three specimens from Finland and one from Estonia are identical (BOLD:ACQ7596), but differ from two German specimens by 5.0–5.5% (no BIN assigned yet, GenBank accessions MW353981 and MW353982). The BOLD:ACQ7596 is closer to *C. pallipes*, differing by a minimum of 4.1%.

Calameuta variabilis (Mocsáry, 1886) comb. nov.

Fig. 5

Cephus quadriguttatus Costa, 1882: 198. ♂. Syntypes. Type locality: Sardinia. Synonymy with *C. haemorrhoidalis* auct. by Ghigi (1905). Primary homonym of *Cephus quadriguttatus* Westwood, 1874. syn. nov.

Cephus variabilis Mocsáry, 1886a: 101, 103. ♀, ♂. Syntypes. Type locality: Kecskemétnél, Herkulesfürdõ, Nagyváradnál, Szilágymegyében Tasnádon, Tasnád-Szántó, and S.-A.-Ujhelynél (Mocsáry 1886b). Lectotype, ♀, designated below.

Cephus quadriguttulatus Dalla Torre, 1894: 412. Replacement name for C. *quadriguttatus* Costa. syn. nov.

Cephus quadrisignatus Costa, 1894: 252. Replacement name for C. *quadriguttatus* Costa. syn. nov.

Cephus haemorrhoidalis var. *signifer* Konow, 1896b: 317–318. ♀. Holotype. Type locality: Syria, Akbes. syn. nov.

Cephus pseudotabidus Kokujev, 1910: 136–137. ♀, ♂. Syntypes. Type locality: Transcaspia. Synonymy with *C. haemorrhoidalis* auct. by Gussakovskij (1935). syn. nov.

Cephus diversipes Ghigi, 1915: 308–309. ♂. Holotype. Type locality: Greece, Rhodos. Synonymised with *C. haemorrhoidalis* auct. by Gussakovskij (1935). syn. nov.

Trachelus syriacus Pic, 1917: 1–2. ♀. Syntypes. Type locality: Syria, Alexandrette. Synonymised with *C. haemorrhoidalis* auct. by Gussakovskij (1935). syn. nov.

Calameuta haemorrhoidalis: Gussakovskij (1935), Benson (1946), and most subsequent authors.

Type material examined and taxonomic notes. Lectotype of *Cephus variabilis* Mocsáry, 1886, hereby designated: ♀, id nr.017651 HNHM Hym.coll. (Fig. 5A); labels (Fig. 5A). Type locality: Romania, Herkulesfürdõ (HNHM). Paralectotypes (all HNHM): 5♂ and 2♀ also belong to the type series and have been labelled as paralectotypes: details of their sexes and localities were given by Zombori (1978). Note that the type series is heterogeneous, and contains specimens of *Calameuta punctata* as well as *C. variabilis*. Zombori noted the heterogeneity of the type series, but did not publish a lectotype designation, although the specimens

Figure 5. *Calameuta variabilis* (Mocsáry, 1886). **A.** Lateral habitus and labels, lectotype ♀ *Cephus variabilis* Mocsáry, 1886; **B.** Maxillary palp ♀ (DEI-GISHym14072). Palpomeres 5 and 6 (arrows); **C.** Thorax, dorsal ♀(DEI-GISHym14072). Mesoscutum (arrow).

were labelled by him as lectotype and paralectotypes. The types were found by Z. Vas in the HNHM, grouped as stated by Zombori. We do not follow Zombori's intention according to his labels, but designate the female from Herculesfürdö (= Baile Herculane, Romania) (id nr. 017651 HNHM Hym. coll., labelled by Z. Vas) as lectotype (Fig. 5A). Thus, *Calameuta variabilis* (Mocsáry, 1886) comb. nov. can be used as a valid name for *Calameuta haemorrhoidalis* sensu Gussakovskij et auct.

Cephus atripes Stephens, 1835 has sometimes been listed as a synonym of *C. variabilis*, e,g. by Taeger et al. (2010, under *Calameuta haemorrhoidalis*). The type specimen, or specimens, is probably lost. The description is short, and does not state the sex of the described specimens(s). de Dalla Torre (1894) treated *C. atripes* as a synonym of *C. pygmeus* (Linnaeus, 1767) and Konow (1905a) as a synonym of *C. haemorrhoidalis*. The color pattern described by Stephens does not fit very well with either of these, in either sex, nor with any other known north-west European cephid species. Stephens' name is best treated as a species inquirendae.

Biology and distribution. According to Macek et al. (2020, under *Calameuta haemorrhoidalis*) the host plants of *C. variabilis* are various Poaceae, including cereals such as rye (*Secale cereale*) and wheat (*Triticum*). According to our personal experiences, adults occur in dry places, mostly on or near wild grasses. The taxon to which the name *C. variabilis* is now applied has so far been found only in the West Palaearctic, and has an essentially Mediterranean distribution, summarized by Gussakovskij (1935) as comprising southern Europe, Crimea, Caucasus, western Turkmenia (Kopet-Dagh) and Syria. In Central Europe, it reaches at least as far north as Hungary (Zombori 1978), but specimens recorded from Austria and the Czech Republic (see Taeger et al. 2006) should be checked.

Identification of *Calameuta punctata* and *C. variabilis*

1 **a** Maxillary palpomere 5 much shorter than apical (6th) palpomere (Fig. 3D) **b** Whole mesoscutum densely pitted, with interspaces sculptured and matt (Fig. 3B) **c** Frontal groove broad, at least as wide as diameter of front ocellus, somewhat narrowing towards antennae **d** ♀ may have mediodorsal yellow markings on otherwise black terga 4–8 (Fig. 4A–C)..... ..... **C. punctata** (Klug, 1803)

– **aa** Maxillary palpomere 5 about equal in length to apical (6th) palpomere (Fig. 5B) **bb** Mesoscutum with large, shiny interspaces, particularly in the middle (Fig. 5C) **cc** Frontal groove narrow, at most half as wide as diameter of front ocellus, same width over entire length **dd** ♀ with at most tiny, ventrolateral yellow flecks on otherwise black terga 5–7 .... **C. variabilis** (Mocsáry, 1886)

The differences described above in the coloration of the abdomen apply to all European specimens seen, but very much paler specimens of *C. variabilis* are known from Turkey and Syria, e.g. the female described by Konow (1896b) as *Cephus haemorrhoidalis* var. *signifer*. Zombori (1978) stated that the coloration of the antennae can also be used to distinguish *punctata* and *variabilis*, but no clear differences were detected in the material studied.

Synonymy of *Cephalcia intermedia* Hellén, 1948 with *Cephalcia arvensis* Panzer, 1802 (Pamphiliidae)

Cephalcia arvensis Panzer, 1802

Fig. 6

Cephalcia arvensis Panzer, 1802: vol. 86 pl. 9. ♀. Syntypes. Type locality: Germany [according to title of work]. Blank et al. (2009); Nomen protectum with respect to *Psen lucorum* Schrank, 1802, nomen oblitum.

Cephalcia abietis var. *intermedia* Hellén, 1948: 40–41. ♀. Syntypes. Type locality: Russia, Karelia, Paanajärvi.

Cephalcia intermedia: Vikberg (1982); raised to species rank. Van Achterberg and van Aartsen (1986); synonymy with *C. lariciphila* (Wachtl, 1898). syn. nov.

Notes. *Cephalcia intermedia* has in recent years mostly been understood as a distinct species close to *C. arvensis* (e.g. Viitasaari 2002b, Taeger et al. 2006), but with more extensively dark-patterned adults, occurring in northern Europe and the central European mountains. Because of its dark coloration, specimens of *C. intermedia* can also be mixed up with *C. lariciphila* (Wachtl, 1898), but the host plant of *C. intermedia* is *Picea*, as in *C. arvensis*, not *Larix* as in *C. lariciphila*. The status of *C. intermedia* and the supposed differences to *C. arvensis* were discussed by Vikberg (1982), Shinohara (1985), Midtgaard (1987) and Viitasaari (2002b). The only differences between *C. arvensis* and *C. intermedia* are in coloration: mainly of the abdomen, and less so of the antennae and legs. Shinohara (1985) pointed out that an unbroken range of color variability occurs between pale *C. arvensis* and the dark specimens identified as *C. intermedia*. This is in accordance with our observations, as the amount of dark color on the male abdomen varies considerably even in a single locality (Fig. 6). Small differences in colouration of larvae are possibly not constant, as the larvae of *C. intermedia* used for comparison were offspring of a single female. At present, there seems to be no convincing evidence for treating *C. intermedia* as a species distinct from *C. arvensis*, and we therefore synonymize them.

The taxonomy of *Claremontia confusa* and *Claremontia brevicornis* (Tenthredinidae, Blennocampinae)

Two morphologically similar *Claremontia* species have been treated taxonomically by different authors in a number of different ways.

Claremontia confusa (Konow, 1886) sp. rev.

Fig. 7A

Blennocampa confusa Konow, 1886b: 82. ♀. Type locality: Germany. Neotype ♀ (ZMHB) designated by Koch (1988). Synonymy with *Claremontia brevicornis* proposed by Koch (1988), wherein he overlooked the priority of the name *brevicornis* (Blank and Taeger 1998). *Monophadnoides confusa*: Benson (1952); treated as species distinct from *M. puncticeps*, cultivated *Fragaria* species recorded as hosts of larva.

Biology. Substantiating the statement about the host plant by Benson (1952), the ZMUO specimens, collected in the Helsinki area, were reared from larvae feeding on cultivated *Fragaria*.

Claremontia brevicornis (Brischke, 1883)

Fig. 7B, C

Blennocampa brevicornis Brischke, 1883: 282–283. ♀. Syntypes (assumed). Type locality: Poland ["Westpreußen" = western Prussia]. Types probably lost (Blank and Taeger 1998).

Blennocampa puncticeps Konow, 1886a: 215–216. ♀, ♂. Syntypes. Type locality: Switzerland, Zürich. Lectotype ♀ (SDEI) designated by Koch (1988). Treated by Koch (1988) as a synonym of *Claremontia confusa*.

Monophadnoides puncticeps: Benson, 1952; treated as species distinct from *M. confusa*, and *Poterium sanguisorba* [currently *Sanguisorba minor*] recorded as host of larva. Chambers (1961): *Potentilla reptans* recorded as host of larva.

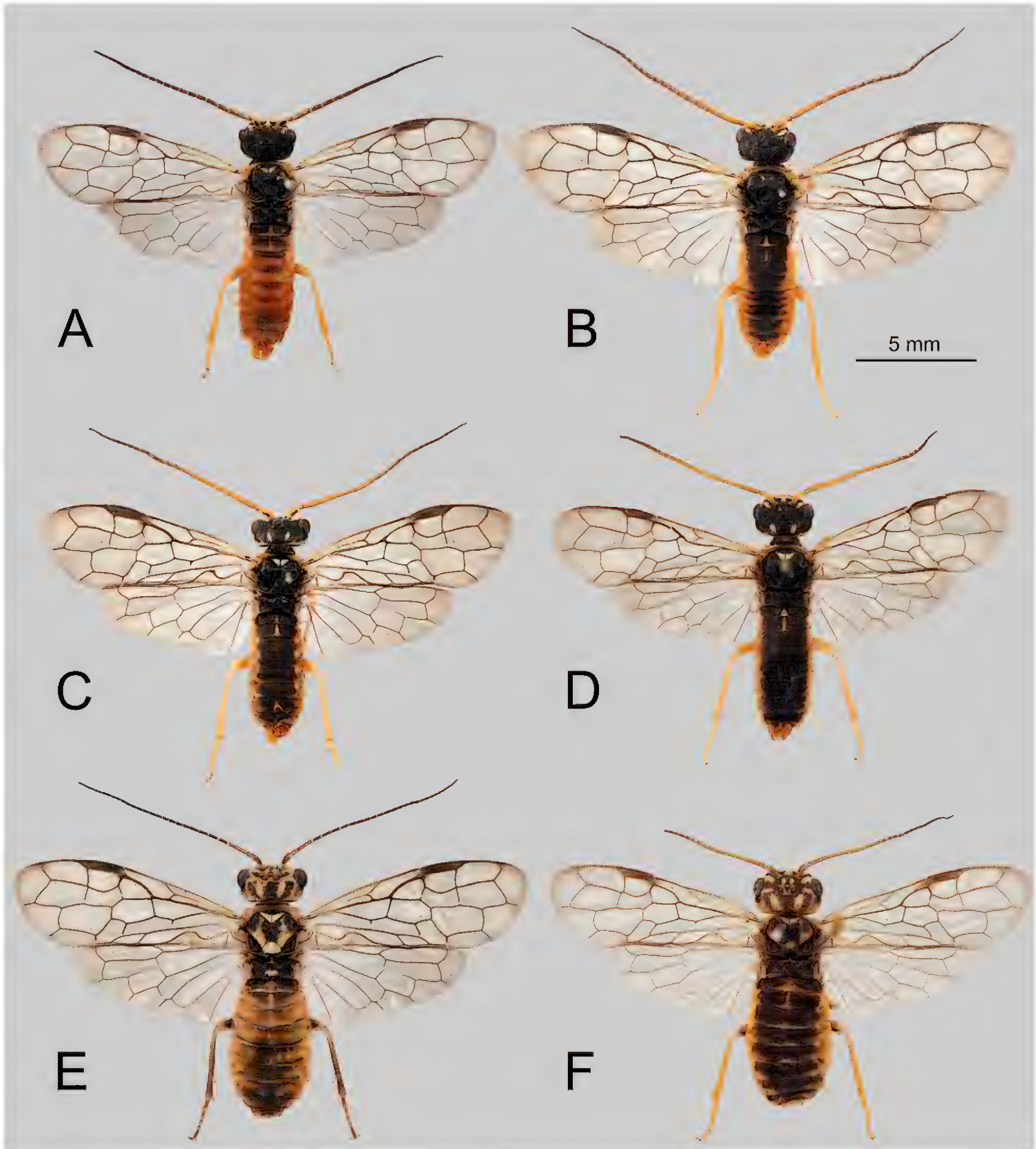

Figure 6. *Cephalcia arvensis* Panzer, 1802. Variability in colour pattern, dorsal habitus. **A–D.** Males (ZMUO.032092, ZMUO.033004, ZMUO.030747, GP.108460). **E, F.** Females (ZMUO.040720, GP.108471).

Biology. ZMUO specimens, from Finland, are not reared; *Sanguisorba*, recorded as a host plant by Benson (1952), can be excluded as a possible host plant at these localities, but *Potentilla erecta* is present in abundance at one of the localities in Eastern Finland.

Taxonomic notes. Konow (1886a), in a key, described the tibiae of *Claremontia confusa* (as *Blennocampa confusa*) as mainly black with only the knees very narrowly whitish and the protibia only whitish on the anterior face, and wrote that the tibiae of *C. puncticeps* were mainly pale. Benson (1952) and Lacourt (2020), among others, distinguished *Claremontia brevicornis* (as *confusa*) from *C. puncticeps* using several characters, also including the color of the metatibia of females. However, Brischke (1883) described the metatibia of *Claremontia brevicornis*, a nominal species not known to Konow (1886a), as extensively yellow-white. Numerous barcoded females (SDEI, ZMUO) belong to two separate COI sequence clusters (distance 3.1–5.8%), which correlate fully with their leg color. Accordingly,

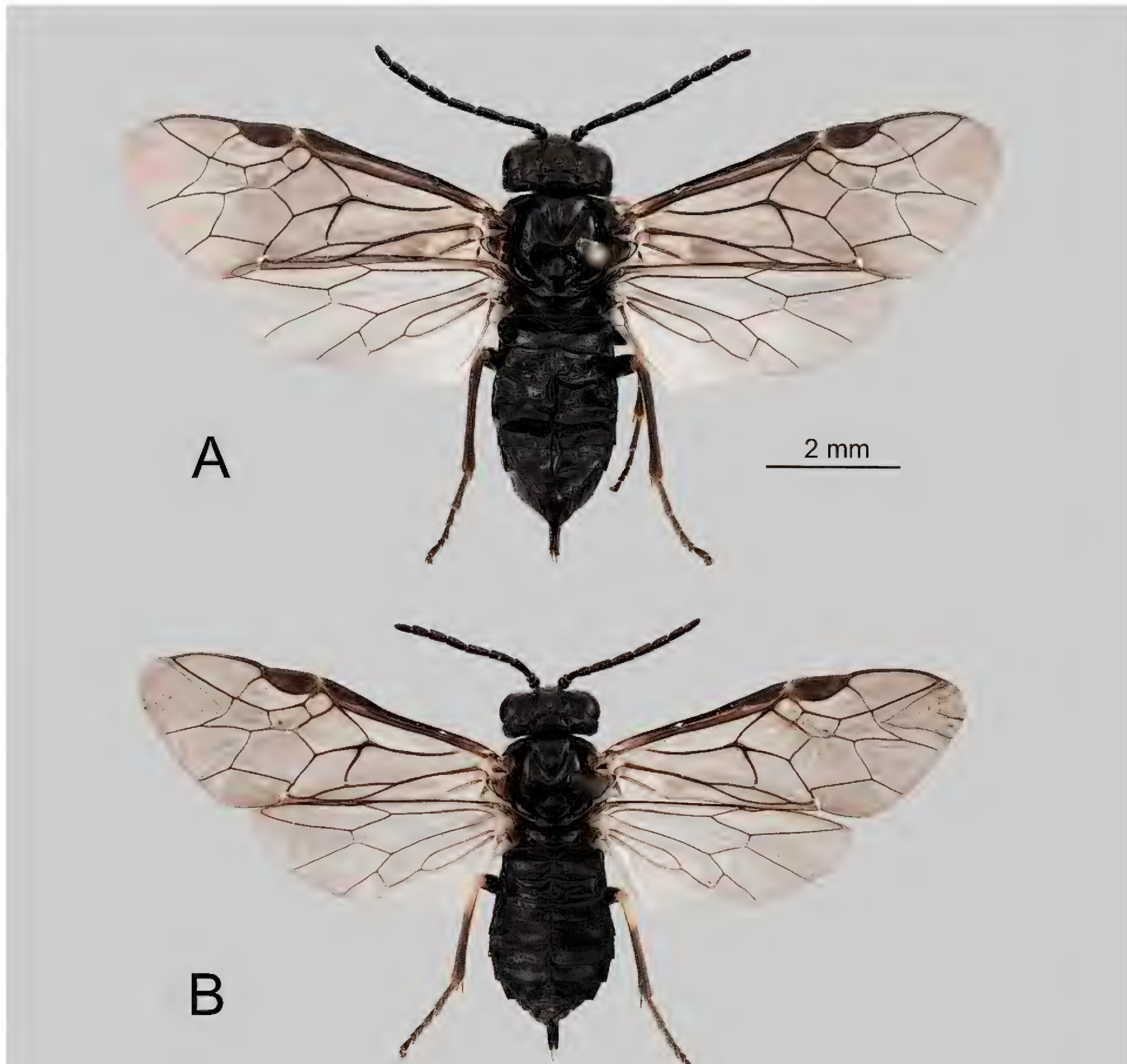

Figure 7. A. *Claremontia confusa* (Konow, 1886). Dorsal habitus ♀ (ZMUO.044470); **B, C.** *Claremontia brevicornis* (Brischke, 1883), dorsal habitus; **B.** ♀ (ZMUO.039550); **C.** ♂ (ZMUO.031990).

we think that the original description of *C. brevicornis* refers to what has more recently come to be known as *C. puncticeps*, and that the correct name for the other species is *C. confusa*. Unlike some previous authors, we did not detect a clear difference in the sculpture of the head of the two forms. Distinction of the males is problematic, because of the lack of reliably identified male specimens of *C. confusa*. Benson (1952) stated that *C. confusa* "is entirely parthenogenetic, at least in Britain". On the other hand, several male specimens of *C. brevicornis* (Fig. 7C) have been barcoded, and can thus definitely be associated with that species. Based mainly on barcode-sequenced specimens in ZMUO, females of *Claremontia confusa* and *C. brevicornis* may be separated as follows.

1 **a** Length of antenna subequal to length of costa (Fig. 7A) **b** Metatibia completely black, or with base narrowly pale (Fig. 7A) [More robust body shape and slightly darker wings]..... *C. confusa* (Konow, 1886)

– **aa** Antenna approximately 0.65–0.80 as long as costa (Fig. 7B) **bb** Metatibia usually extensively pale, with at least base whitish (Fig. 7B) [More slender body shape and slightly paler wings].....*C. brevicornis* (Brischke, 1883)

The taxonomy and nomenclature of some *Dolerus* species (Tenthredinidae, Selandriinae)

The syntypes of some *Dolerus* species described by Serville (MNHN) were labelled by A. Haris as lectotypes and paralectotypes, but he published no designations. Statements by Lacourt (2000) such as "LECTOTYPE designated by A. Haris, 1996", based on Haris' labels, are not valid lectotype designations according to the 4th edition of the ICZN (Article 74.7.3 and the corresponding Amendment, ICZN 1999), because they were published after 01.01.2000. Note also, that Lacourt (2000) did not state that his work was submitted for publication before 01.01.2000 and that it contains nomenclatural acts proposed under the provisions of the 3rd edition of the Code (ICZN 1985) which was in force before 01.01.2000. We assume that Lacourt did not intend these statements to function as designations. Accordingly, valid lectotype designations are made below for *D. bajulus*, *D. cothurnatus*, and *D. ferrugatus*.

Dolerus aericeps Thomson, 1871

Dolerus aericeps Thomson, 1871: 285. ♀, ♂. Syntypes. Published type locality: "södra Sverige" [southern Sweden]. Lectotype designated below.

Tenthredo Eglanteriae [sic!] Fabricius, 1793: 109–110. syn. nov., nomen oblitum. ♀. Syntypes (assumed). Published type locality: "Habitat in Germania. Dom. Smidt." [Germany]. Lectotype designated below.

Tenthredo (*Dolerus*) *palustris* Klug, 1818: 296–297. ♀, ♂. Syntypes. Published type locality: "Deutschland". Lectotype designated below. Primary homonym of *Tenthredo* (*Allantus*) *palustris* Klug, 1818. syn. nov.

Dolerus bajulus Serville, 1823: 58. ♀. Syntypes (assumed). Type locality: "Paris". Lectotype designated below.

Type material examined and taxonomic notes. *Dolerus aericeps* Thomson, 1871. Lectotype ♀ hereby designated, labelled: "Båst[ad]" [Type locality: Sweden, Skåne, Båstad], "*aericeps"* [blue line along upper margin], "MZLU 2013 416" [pale green, printed, loan record], "*Lectotypus* 2014 *Dolerus aericeps* ♀ Thomson, 1871 M.Heidemaa design." [printed, red], "*Dolerus aericeps* Thomson, 1871 M.Heidemaa det.". In excellent condition. MZLU. Paralectotypes: 2♀, 2♂. MZLU.

Tenthredo eglanteriae Fabricius, 1793. Lectotype ♀ hereby designated, labelled: "*eglan*[...]*riae*", "LECTOTYPE *Tenthredo eglanteriae* Fabricius, 1793 des. SM-Blank 2008" [red, printed], "*Dolerus eglanteriae* (F.) = *bajulus* Serv. [handwritten] det. S.M.Blank 2008 ✓" [printed], "ZMUC-GISHym 1014", "*Dolerus aericeps* Thomson, 1871 M.Heidemaa det." [printed]. Left hind tarsus and some other tarsomeres missing. ZMUC.

Among 2♀ and 1♂ specimens preserved in the ZMUC collection under the name *T. eglanteriae*, only the above female can be regarded as a syntype. The scutellum of the other female is red, and the tip of the abdomen of the male black. Both characters conflict with Fabricius' original description. Compared with the other two specimens, the pale parts of the legs of the lectotype are darkened. The lectotype agrees with the species which has for a long time been known as *Dolerus aericeps* Thomson, 1871 (Zhelochovtsev 1994), characterized for example by the laterally directed and distally curved setae of the ovipositor sheath. Lacourt (2000) used the name *D. bajulus* Serville, 1823 for this species, but Blank et al. (2009) presented arguments for the use of the name *D. aericeps* (nomen protectum) versus *D. bajulus* (nomen oblitum). *Tenthredo eglanteriae* was synonymized with *T. germanica* by Klug (1819) and with *Athalia glabricollis* Thomson, 1870 by Konow (1897a). Since Brullé (1846), *T. eglanteriae* (nomen oblitum) has never again been used as valid, while between 1971–2021 the name *Dolerus aericeps* (nomen protectum) was used as valid by more than 120 authors in over 150 publications (Article 23.9.1, ICZN 1999). One paralectotype male of *D. cothurnatus* Serville belongs to this species (see under *D. germanicus*).

Tenthredo (*Dolerus*) *palustris* Klug, 1818. Lectotype ♂ hereby designated, labelled: "14190" [collection catalog no.], "cotypus von *Dol. palustris* Klg. = *aericeps* Thoms. O.Conde det 1941" [handwritten by Otto Conde], "GBIF-GISHym 2342" [printed], "*Lectotypus* [printed] ♂ *Tenthredo* (*Dolerus*) *palustris* Klug, 1818 [handwritten in block letters] M.Heidemaa des. [printed]" [red], "*Dolerus aericeps* Thomson, 1871 M.Heidemaa det.", "Zool. Mus. Berlin" [printed]. Left forewing and

metatarsi missing, half of the genital capsule glued on a paper card and pinned with the lectotype. Paralectotype ♂ ("GBIF-GISHym 2341") with same labelling (except "*Paralectotypus*"). All in ZMHB.

Formerly placed as a synonym of *D. cothurnatus* auct. (= *D. junci* (Stephens, 1835)), e.g. by Taeger et al. (2010).

Dolerus bajulus Serville, 1823. Lectotype ♀ hereby designated, labelled: "*Dolerus bajulus*, Lep.", "Lectotype [red, printed in block letters]", "Lectotype D. bajulus LEP. det.: H.Haris 1996" [white], "*D. aericeps* THOMS. ♀ det.: A.Haris", "Lectotypus [printed] ♀[handwritten] *Dolerus bajulus* Serville, 1823 [handwritten in block letters] M.Heidemaa design." [printed, red]. "*Dolerus aericeps* Thomson, 1871 M.Heidemaa det" [printed]. MNHN.

Dolerus aericepsellus Heidemaa & Mutanen, sp. nov.

https://zoobank.org/36982FA3-A66B-448B-8A4C-DC4B2883C45B

Figs 8, 9

Description. ***Holotype*** ♀. Figs 8A, B, 9B, C.

Colour. Fig. 8A, B. Body black with terga 2–7 and sterna 2–7 orange. Terga 8–9 brownish black, 10 brownish basally but yellowish brown apically, apical third of protibiae brownish. Ventral margin of valvula 3 and cerci brownish. Wings clear.

Measurements (mm). Body length: 5.0, distance from tegula to base of pterostigma: 3.1, head breadths: 1.46 (max. at eyes), 1.28 (max. behind eyes), 1.07 (min. behind eyes), head length (behind eyes): 0.21, max diameter of eye: 0.62, breadth of postocellar field: 0.36, OC: 0.96, OOCL: 0.35, OOL: 0.20, POL: 0.19. Length of: metafemur: 1.18, metatibia: 1.76, ovipositor sheath (from the base of valvifer 2 to the apex of valvula 3): 1.01. Length of flagellomeres: 1: 0.48, 2: 0.41, 3: 0.37, 4: 0.31, 5: 0.29, 6: 0.26, 7: 0.25.

Large structures. Clypeal emargination almost half as deep as clypeal median length. Clypeus asymmetrical, its antero-lateral lobes round at apex, the left lobe longer than the right. Distance between antennal sockets 1.6× as long as the malar space. Length of antennomere 3 about 1.24× that of 4. Oblique furrow not outlined. Distance between cenchri about 1.1× as long as width of cenchrus. Metatarsomere 1 about 1.75× as long as 2. Mesoscutellar appendage with weakly outlined ridge medially.

Setae. Metascutellum with few setae (about 5). Abdomen dorsally mostly pubescent from segment 7 to last one (laterally and ventrally from 2 to last one). Longest setae of valvula 3 in dorsal view markedly curved in apical third, and forming an angle of about 80–90° (Fig. 9B).

Macrosculpture. Pits on head rather irregular in size and distribution, more distinct and separated on postocular and postocellar area. Density and size of pits on thorax vary, the largest (partly fused) on lateral sides of median mesoscutal lobes and on mesoscutellum. Pits on lateral lobes of mesoscutellum and near the median mesoscutal groove sparse and small. Pits on mesepisternum largest, partly isolated and round, partly polygonal and fused (Fig. 9C). Distinct pits on pectus nearly absent (Fig. 9C).

Microsculpture. Meshes on mesoscutellar appendage extensive, on tergum 1 absent, on metepimeron (Fig. 9C) and on ventral surface of metacoxa absent. Sculpticells on anterior half of katepimeron of mesopleuron rib-like, irregular and of uneven height, and absent on metepimeron, pectus, and terga (all glossy).

Male. Figs 8C, D, 9A, D–G. Closely resembles the female, but the anterior margin of tergum 2 blackish, basal 2/3 of hind tibia (with apical spurs), and base of metatarsomere 1 reddish yellow (Fig. 8C, D). Penis valve valviceps long and narrow (Fig. 9G).

Measurements (mm). Body length (paratype male ZMUO.035740): 5.3, distance from tegula to base of pterostigma: 3.2, max. diameter of eye: 0.60, head breadth: 1.47 (max. at eyes), breath of postocellar field: 0.38, head length (behind eyes): 0.24, OC: 1.01, OOCL: 0.18, OOL: 0.29, POL: 0.21, metafemur: 1.25, metatibia: 1.64, metatarsus: 0.50. Length of flagellomeres: 1: 0.59, 2: 0.51, 3: 0.50, 4: 0.44, 5: 0.41, 6: 0.39, 7: 0.41.

Genetic data. Three specimens with DNA barcode sequence data are available. They comprise a distinct cluster BIN BOLD:ABV8002, with 0.3% intraspecific variability. Based on sequences longer than 600 bp, the minimum distance to the closest relative *D. aericeps* (n=26) is 3.9%, but a few specimens identified as *D. yukonensis* from North America show a minimum distance of even less, 3.6%.

Differential diagnosis. Adults of *D. aericepsellus* are most similar to *D. aericeps* Thomson, but are distinguished by the following characters: smaller body size (similar to *D. elderi* Kincaid, 1900, or smaller); very short, strongly narrowing postocular area; glossy metascutellum with few distinct pits and setae (3–6); pectus without distinct pits; and thorax black, including tegulae (based on the barcoded specimens: 1♀ 2♂). Lateral postocellar furrows very distinct in both sexes (Fig 9F), like in *D. aericeps* and *D. incisus*. The thorax of female *D. aericeps* is usually largely red, whereas in the *D. aericepsellus* paratype female it is almost entirely black. *Dolerus aericeps* ab. *nigricollis* was described by Lindqvist (1943) from northern Finland close to the localities where *D. aericepsellus* was collected. We examined the type specimen of *Dolerus aericeps* ab. *nigricollis* deposited in the MZH and found that it is not conspecific with *D. aericepsellus* but with *D. aericeps*, although it has a nearly completely black thorax, with two obscure reddish flecks. Some other examined specimens of *D. aericeps* from northern Finland show reduced red markings on the thorax, suggesting that this character varies in *D. aericeps*.

Type material. ***Holotype*** ♀. Type locality: Finland, Enontekiö, Pousu. Labelled [white, printed if not given otherwise]: "FIN Le Enontekiö Pousu 7651:3266 [68.846°N, 21.197°E] 27.6.2020 Marko Mutanen leg.", "Sawfly tissue 2020-1079 M.Mutanen" [greenish], "http://id.zmuo.oulu/fi/ZMUO.044566", "Holotypus [block letters] ♀ *Dolerus aericepsellus* Heidemaa & Mutanen, 2022 [handwritten in block letters] des. M. Heidemaa" [red]. Good condition: wings spread, left fore and mid legs removed as tissue samples. ZMUO.

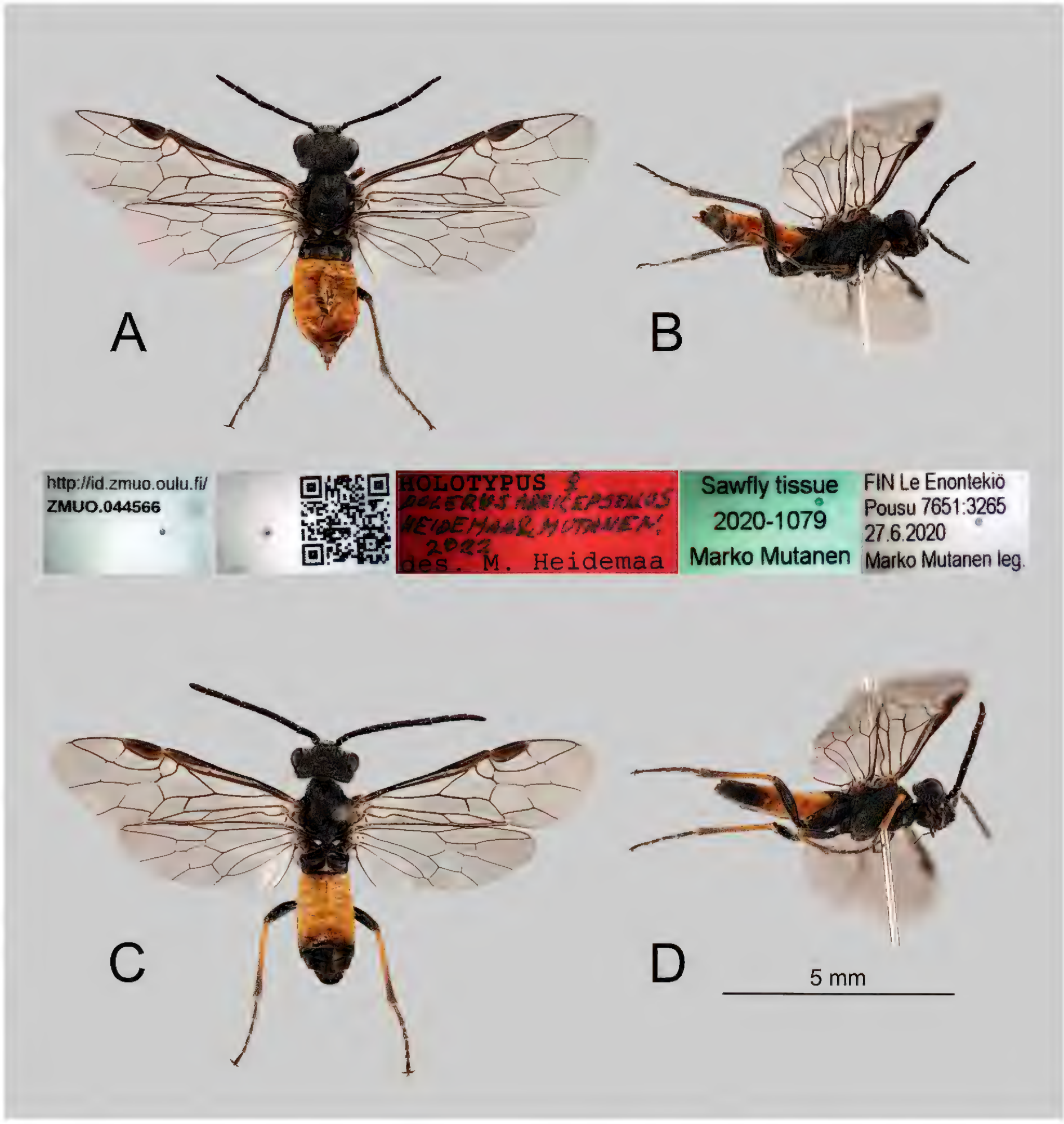

Figure 8. *Dolerus aericepsellus* sp. nov. **A, B.** Holotype ♀ (ZMUO.044566); **A.** Dorsal habitus; **B.** Lateral habitus and labels (below); **C, D.** Paratype ♂ (ZMUO.035740); **C.** Dorsal habitus; **D.** Lateral habitus.

Paratypes. Total: 1 ♀, 3 ♂: Finland: Lapponia inarensis, Utsjoki Pulmankijärvi, YKJ grid coordinates: 7761:3539 [69.928°N, 28.031°E], 1♂ (ZMUO.033245) 07.07.2017, leg. M. Mutanen, N. Mutanen, A. Mutanen, SDEI. 1♂ (ZMUO.035740) (Fig. 9A, D–G), same collection data as preceding, but 05.07.2018, ZMUO. Lapin Lääni, Nuorgam 17 km SSE, 69.944°N, 28.041°E, 1♀ (BC ZSM HYM 11450), leg. M. Kraus, ZSM. 1♂ (BC ZSM HYM 11451), same collection data as preceding, ZSM.

Etymology. The name is an adjective derived from the species name of its closely similar sister species, *D. aericeps* Thomson, using the Latin diminutive suffix *-ellus*.

The taxonomy of *Dolerus anthracinus* (Klug, 1818) and *D. coracinus* (Klug, 1818)

A recent, thorough study of the type specimens of *D. anthracinus* (a syntype male) and *D. coracinus* (a syntype female) revealed that the corresponding names have been applied to the wrong species by most of the later authors who followed Konow's interpretations. According to the taxonomic interpretation of the primary types proposed here, the name *D. coracinus* (Klug) is applied to *D. anthracinus* auct. while the name *D. anthracinus* (Klug) applies to a species resembling *D. nitens* Zaddach, 1859 but which has remained overlooked until present. *D. anthracinus*

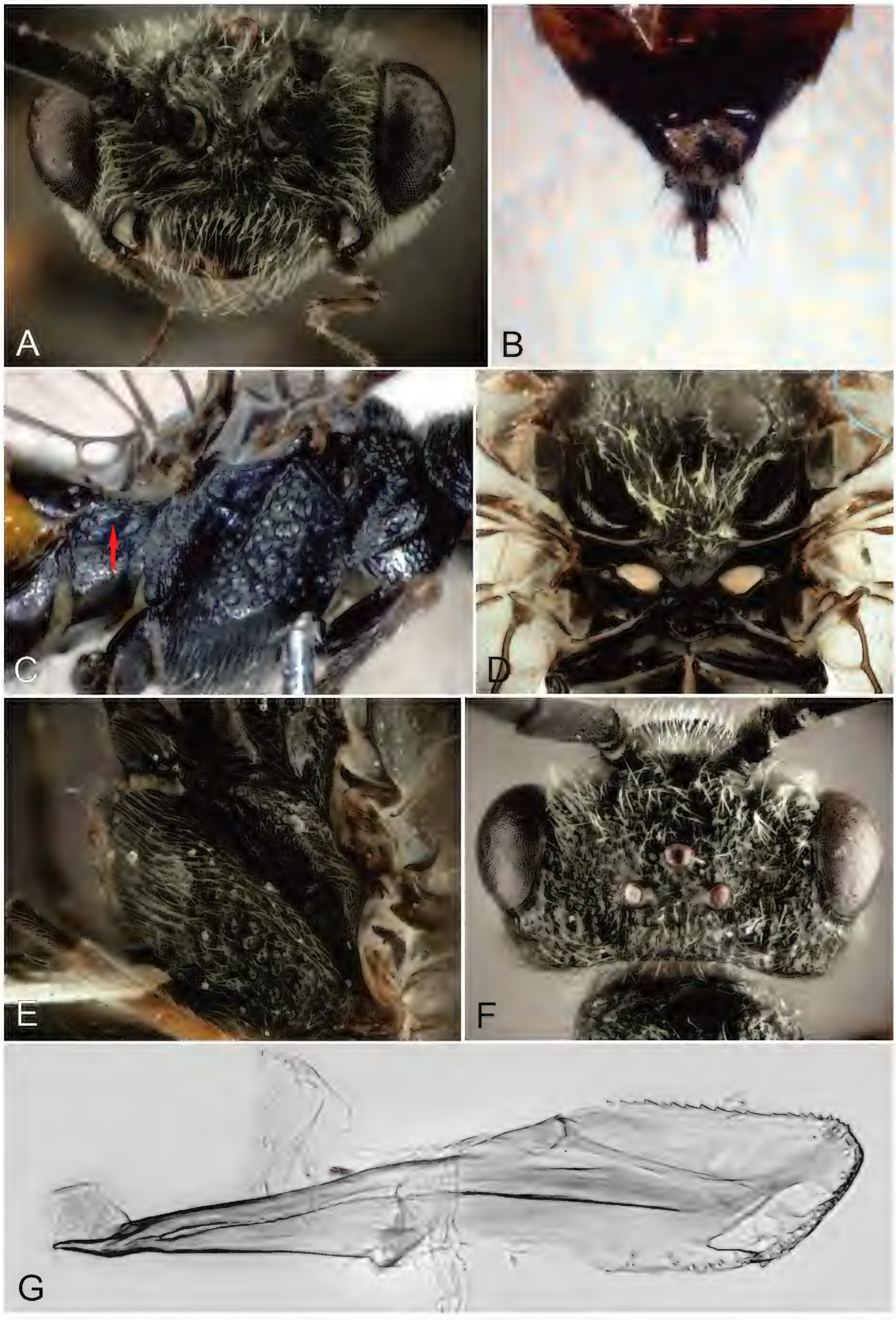

Figure 9. *Dolerus aericepsellus* sp. nov. **A.** Head frontal, paratype ♂ (ZMUO.035740); **B.** Sawsheath dorsal, holotype ♀; **C.** Thorax lateral, holotype ♀, metepimeron (arrow); **D–G.** Paratype ♂ (ZMUO.035740); **D.** Thorax dorsal; **E.** Thorax lateral; **F.** Head dorsal; **G.** Penis valve.

(to be redescribed) and *D. coracinus* auct. (most likely an undescribed species) will be discussed in a separate article which will also include a neotype designation for *D. nitens*.

The original description of *D. anthracinus* did not mention the color of setae, but a more detailed description by Zaddach (1859), based on a male borrowed by him from coll. Klug (most likely the same syntype ♂ as is designated below as lectotype), clearly stated that the *D. anthracinus* male has pale setae like *D. nitens* Zaddach (dark brown in *D. anthracinus* auct.). Both Klug's and Zaddach's descriptions match the only preserved male syntype in Klug's collection labelled as "*anthracina* Kl." [Klug's handwriting]. According to Zaddach, the syntype female of *D. anthracinus*, loaned to him from ZMHB, belonged to *D. carbonarius* Zaddach, but its taxonomic identity remains uncertain because the specimen has not been traced.

The taxonomic identity of *D. anthracinus* has later been misinterpreted, probably because of the confusing comments by Konow (1885, 1886b). At some point Konow misidentified the specimens with dark setae as *D. anthracinus* and regarded *D. atricapillus* Hartig, 1837 as its synonym. Zaddach (1859) mentioned the possibility that *D. coracinus* Klug (which he knew only from the description) could be a female of *D. anthracinus* or *D. nitens*. Nevertheless, Zaddach considered *D. nitens* to be distinct from *D. anthracinus*, although he recognised their close similarity. At present, this decision is also supported by the penis valve structure of the *D. anthracinus* lectotype (Fig. 10A) which is rather similar to that of *D. nitens* (Fig. 10B; several males dissected), but still distinguishable. Additionally, the proportions of the head and the density and distribution of the pits on the vertex of the lectotype differ from males of *D. nitens*.

It is worth noting that Zaddach (1859) and Cameron (1882a) published reasonably detailed figures of the ovipositors of several *Dolerus* species, compared to the cruder illustrations of Hartig (1837), but the structure of male genitalia was not used for species delimitation at that time.

The diagnosis given by Klug (1818) for the female of *D. coracinus* is brief and rather uninformative [translated from Latin]: "antennae shorter than abdomen; ovate, bluish-black, glossy; wings hyaline". Additional characterization is given in German (e.g. "head strongly punctured, mesoscutellum barely convex, abdomen with particularly beautiful sheen"). Zaddach (1859) had already considered the possibility that *D. coracinus* could be the female of *D. anthracinus*, because both syntypes show some bluish reflections. Zaddach was apparently not able to borrow and examine the relevant type specimens, probably because they were the only ones available, but at his request, Gerstäcker (then custodian of Hymenoptera at the Berlin Museum) offered the opinion that *D. coracinus* (female) and *D. anthracinus* (male) could be conspecific. In forming his opinion, Gerstäcker apparently compared the type of *D. coracinus* with some *D. anthracinus* male. According to the circumscription applied here, *D. anthracinus* auct. (= *D. atricapillus* Hartig) is conspecific with the syntype female of *D. coracinus* Klug, because the shape and macrosculpture (distribution of pits) of the median mesoscutal lobes and the color and length of the setae on head and mesepisternum match, as well as their bluish-reflecting bodies. The types of *D. anthracinus* and *D. coracinus* are certainly not conspecific, but most likely the lectotype of *D. anthracinus* is conspecific with the paralectotype female of *D. coruscans* (see below).

Dolerus anthracinus (Klug, 1818)

Fig. 10A

Notes. *Tenthredo* (*Dolerus*) *anthracina* Klug, 1818: 302. ♀, ♂. Syntypes. Type locality: Germany, Gartz in Pommern. Lectotype ♂ hereby designated, labelled: "14205" [collection catalog no., printed], "*Anthracina* Kl." [Klug's handwriting], "Kl." [Klug's handwriting], "GBIF-GISHym 2308" [printed], "Zool. Mus. Berlin" [printed], "Lectotypus ♀ *Tenthredo* (*Dolerus*) *anthracina* Klug, 1818 M.Heidemaa des. '22 [handwritten in block letters]" [red], "*Dolerus anthracinus* (Klug, 1818) M.Heidemaa det. [printed] not *nitens* Zadd." [handwritten in block letters]. ZMHB.

Dolerus coracinus (Klug, 1818)

Tenthredo (*Dolerus*) *coracina* Klug, 1818: 302–303. ♀. Syntypes (assumed). Published type locality: "Kärnthen" (Austria, Carinthia). Lectotype designated below.

Dolerus anthracinus auct. nec Klug. Misidentifications of *D. anthracinus* by, for example: Konow (1885, 1886b), Enslin (1913), Benson (1952), Zhelochovtsev (1994), Lacourt (2020).

Dolerus atricapillus Hartig, 1837: 239. Lectotype ♂ [examined] designated by Blank and Taeger (1992). ZSM. Type locality: Germany. syn. nov.

Type material examined. *Tenthredo* (*Dolerus*) *coracina* Klug, 1818. Lectotype ♀ hereby designated, labelled: "14207" [collection catalog no., printed], "Carinth. Kl." [type locality: Austria, Carinthia, probably Klagenfurt], "*Coracina* Kl." [Klug's handwriting], "GBIF-GISHym 2311" [printed], "Zool. Mus. Berlin" [printed], "Lectotypus ♀ *Tenthredo* (*Dolerus*) *coracina* Klug, 1818 M.Heidemaa des. '22" [block letters, red], "*Dolerus coracinus* (Klug, 1818) M.Heidemaa det. [printed] = *D. anthracinus* auct." [handwritten]. ZMHB.

The taxonomy of *Dolerus cothurnatus* auct. nec Serville, 1823

Dolerus junci (Stephens, 1835) nom. rev.

Dosytheus Junci [sic!] Stephens, 1835: 84–85. Sex not explicitly stated. Syntypes. Published type localty: "Devonshire, and near Windsor" (England). Lectotype designated below.

Dolerus Busaei [sic!] Snellen van Vollenhoven, 1858: 277. Sex not given. Lectotype ♂ designated by Thomas (1987). Type locality: "Haarlem" (Netherlands). syn. nov.

Dolerus cothurnatus auct. nec Serville, 1823 (e.g. Benson 1952, Zhelochovtsev 1994, Lacourt 2020).

Dolerus thargitai Zombori, 1994: 185–187. ♀. Holotype. Type locality: Csíkszentkirály, Borsáros, Kérújfürdő: Tolvajos patak (Romania). syn. nov.

Remarks. Similarly to the melanic color form of *D. yukonensis* (see below), which was described as a distinct species, *D. scoticus*, by Cameron (1881a), the melanic form of *D. junci* was also described as a distinct species, *D. thargitai*, by Zombori (regarded as a synonym of *D. yukonensis* / *D. scoticus* until now). The melanic color form of *D. junci* has also been recorded from central Europe

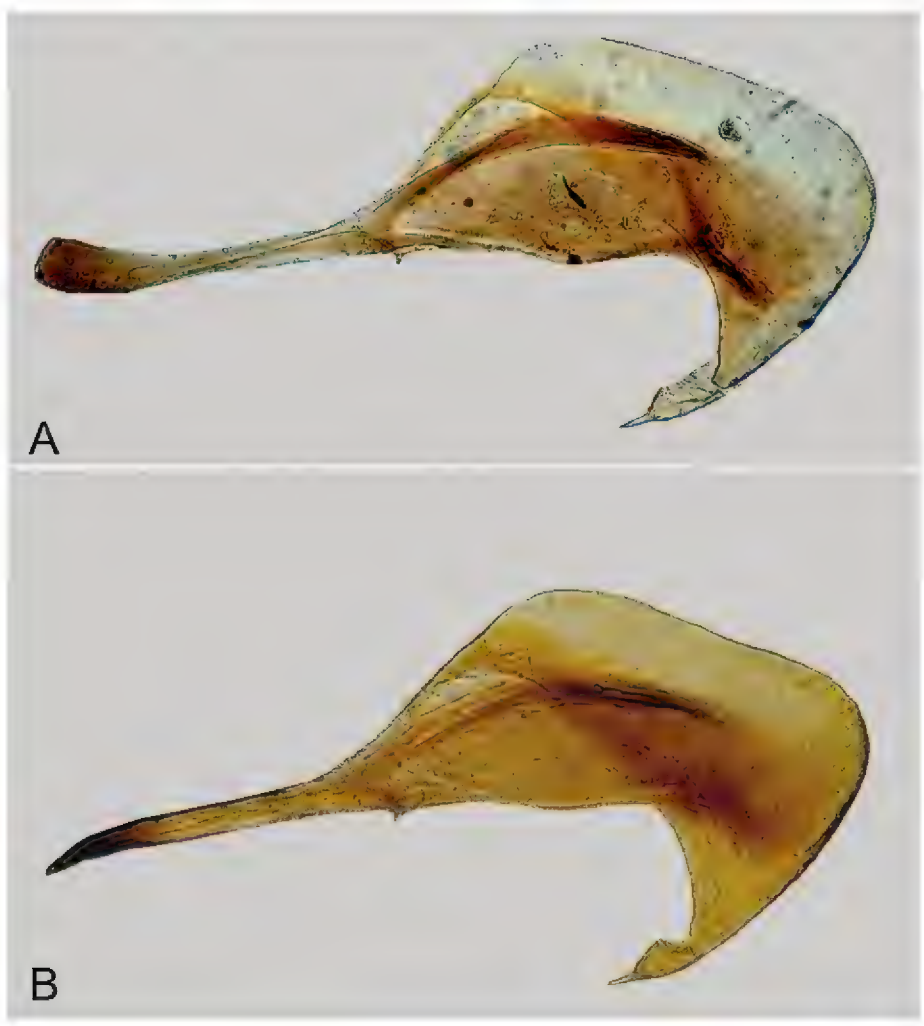

Figure 10. Penis valve. **A.** *Dolerus anthracinus* (Klug, 1818) lectotype; **B.** *Dolerus nitens* Zaddach, 1859.

(Germany) and southern Europe (Italy, Switzerland: see, e.g. Pesarini 2012), but is not known from Fennoscandia. The males of the melanic forms of *D. junci* (01.06.1984) and *D. yukonensis* (24.05.1984) have been collected at the same locality at nearly the same time (Germany: Federsee, Brackenhof, leg. E. Jansen, CEJ). In addition to their different penis valve structure and other characters used in the keys by Benson (1952) and Zhelochovtsev (1994), *D. junci* and *D. yukonensis* differ in the shape and sculpture of the mesoscutellar appendage: almost unsculptured and without a distinct longitudinal keel in the former, and clearly sculptured and with a distinct keel in the latter. Most likely, the melanic color form of *D. junci* does not occur within the geographic range of *D. incisus*, but they can also be distinguished by the shape and the sculpture of the mesoscutellar appendage: meshed (nearly matt) and long, with a distinct median longitudinal keel (*D. incisus*) versus short and almost unsculptured (more or less glossy) and without a distinct median keel (*D. junci*).

Type material examined and taxonomic notes. *Dosytheus junci* Stephens, 1835. Lectotype ♀ hereby designated, labelled: "Type H.T. [holotype]" [round with wide red margin, printed; not a holotype but a syntype!], "B.M. TYPE HYM. [printed] 1.575.", "B.M. TYPE HYM. [printed] *Dosytheus Junci* Stephens 1835.", "*Junci*.", "Stephens Coll. 53–46" [printed], "*Dolerus palustris*, Klug." [printed], "*Lectotypus* 2012 *Dosytheus junci* [printed]♀ [symbol handwritten] Stephens, 1835 M.Heidemaa des. [printed]", "*Dolerus junci* Stephens, 1835 M.Heidemaa det." [printed]. Condition: legs partly destroyed, left midleg missing, the apical flagellomeres missing, apex of left forewing broken. BMNH.

The original description of *D. junci* by Stephens (1835) refers to syntypes ("Devonshire and near Windsor"). Although Kirby (1882) mentioned a "Type of *D. junci*", this cannot be regarded as a lectotype designation, even though he was apparently only able to locate a single specimen.

Dolerus busaei Snellen van Vollenhoven, 1858. Photos of the lectotype and of the penis valve were checked. Left midleg and two segments of the right antenna missing; the genital capsule is glued on a card. RMNH. This nominal taxon was previously treated as a synonym of *D. cothurnatus* auct.

Dolerus cothurnatus auct. nec Serville, 1823. Haris and later Lacourt (2000) studied the syntypes (3 ♂) of *D. cothurnatus* Serville, but not their genitalia. Based on their penis valve structure, none of the syntypes fits *D. cothurnatus* auct.: the two syntypes (among them the one labelled as lectotype) represent *D. germanicus* and the third one is a male of *D. aericeps*. The name *D. cothurnatus* by Serville is placed here as a junior synonym of *D. germanicus*, by designating its lectotype (see also under *D. germanicus*), and the name *Dolerus junci* (Stephens, 1835) has to be used for *D. cothurnatus* auct. nec Serville.

Dolerus thargitai Zombori, 1994. The holotype and some paratypes (2♀, 4♂) were studied. HNHM.

The taxonomy of *Dolerus fumosus* Stephens, 1835 and *D. sanguinicollis* (Klug, 1818)

Based partly on some rather subtle diagnostic characters (most of them given for the females), Lacourt (1998, 2020) suggested that *Dolerus fumosus* and *D. sanguinicollis* are distinct species. Their distribution overlaps only partly: the former is a more northern species than the latter. On the other hand, the existence of intermediate color forms in the females (from almost black to distinctly red-marked thorax) and at least one "outlier" from the North, a Finnish female with an extensively red-marked thorax, could suggest that the forms with black (*D. fumosus*) and with more or less red-marked thorax (mostly identified as *D. sanguinicollis*) might merely represent different color forms of the same species, as in, for example, *Dolerus liogaster* and *Eutomostethus ephippium*. The sculpture of the mesoscutellar appendage, given by Lacourt (1998) as the only diagnostic character for the separation of both sexes of *D. fumosus* (meshed) and *D. sanguinicollis* (absent, glossy), becomes problematic when specimens

from wider geographical ranges are examined. One of only two red-marked specimens from Finland has an almost glossy mesoscutellar appendage, like *D. sanguinicollis*, but is probably nevertheless *D. fumosus* (the shape of the appendage is closer to *D. fumosus*). However, if the sculpture and shape of the mesoscutellar appendage, the shape and length of the head behind the eyes in dorsal view, and the proportions of the postocellar field are used in combination, the females can be more confidently separated into two groups which seem to correlate with slight differences in the shape of their basalmost serrulae (Fig. 12C, D). Because the two distinct clusters formed by the COI barcodes correspond broadly with the grouping based on the colour of the thorax (black versus red-marked females), but a few exceptions occur in each barcode cluster, we suggest that both species have a melanic color form as well as forms with a red-marked thorax. *Dolerus sanguinicollis* var. *reicherti*, with some red markings, belongs in fact to *D. fumosus*, not to *D. sanguinicollis*. No males of *D. fumosus* or *D. sanguinicollis* with a red-marked thorax are so far known. The differences in morphology of the head and mesoscutellar appendage are shared by both sexes, thus enabling the preliminary differentiation of the males without dissecting their penis valves. On the other hand, both sexes of the related *Dolerus noblecourti* Lacourt, 2004 (southern France and Iberian Peninsula) have a red-marked thorax, making its male easily recognizable. The females of *D. noblecourti* Lacourt, 2004 are separable from *D. sanguinicollis* using the sculpture of the mesoscutellar appendage, the structure of the ovipositor, and the shape and setation of the valvula 3. More material should be dissected, examined and barcoded from the regions where *D. fumosus* and *D. sanguinicollis* are sympatric and the intermediate color forms occur.

Females of the two species can usually be separated as follows:

1 **a** Thorax mostly blackish, without red pattern (Fig. 11A, B) **b** Mesoscutellar appendage without longitudinal ridge (keel) and usually at least partly sculptured **c** Head behind eyes slightly narrowing (Fig. 12A), postocellar field almost square-shaped, longer than distance from anterior margin of median ocellus to the posterior margin of lateral ocellus, not strongly convex **d** Anterior half of katepimeron of mesopleuron more or less similarly sculptured (worm-like sculpticells) as the rest of it (Fig. 12G) ..... *D. fumosus* Stephens, 1835

– **aa** Thorax mostly with red pattern, rarely fully black (Fig. 11E, F) **bb** Mesoscutellar appendage with more or less distinct longitudinal ridge, but without any distinct sculpture, glossy **cc** Head behind eyes more clearly narrowing (Fig. 12B), postocellar field transverse, its length about equal to the distance from anterior margin of median ocellus to the posterior margin of lateral ocellus, convex and distinctly outlined by lateral postocellar furrows **dd** Anterior half of katepimeron of mesopleuron differently sculptured, at least partly granulate or pitted, compared to the remainder (worm- and/or rib-like sculpticells, Fig. 12H) ..... *D. sanguinicollis* (Klug, 1818)

Dolerus fumosus Stephens, 1835

Figs 11A–D, 12A, C, E, G–I

Dolerus fumosus Stephens, 1835: 87. Sex not stated. Syntypes (assumed). Type locality: Hertford (UK). Lectotype designated below.

Dolerus Lucens [sic!] André, 1880: 276–277. ♀, ♂. Syntypes. Published type locality: Hongrie (Hungary). Lectotype designated below. syn. nov.

Dolerus sanguinicollis var. *Reicherti* [sic!] Konow, 1894b: 134. ♀. Holotype. Type locality: near Leipzig (Germany). SDEI. syn. nov.

Type material examined and taxonomic notes. *Dolerus fumosus* Stephens, 1835. Lectotype ♀ hereby designated, labelled: "Type H.T." [round with wide red margin, printed], "B.M. TYPE HYM. [printed] 1.572.", "B.M. TYPE HYM. [printed] *Dolerus fumosus* (Stephens 1835)", "*fumosus*.", "Stephens Coll. 53–46" [printed], "Lectotypus 2012 *Dolerus fumosus* ♀ [the symbol handwritten] Stephens, 1835 M.Heidemaa des." [red, printed], "*Dolerus sanguinicollis* Klug M.Heidemaa det." [printed] [Identified before it became clear that two species were mixed up under this name.] Condition poor: mid- and hind tarsi incomplete, 2 apical flagellomeres of the right antenna missing, abdomen partly damaged. BMNH.

Kirby (1882) referred to the "Types (♂, ♀)". The number of syntypes of *D. fumosus* was not given by Stephens, but only one syntype female is now present in the collection (BMNH).

Dolerus lucens André, 1880. Lectotype ♂ hereby designated, labelled: "Jászó" [Type locality: Hungary, Jászó (Jasov)], "272", "Hongrie" [printed in block letters], "*D. lucens*, André." [printed], "DEI GISHym 89371" [printed], "coll. Desbrochers [handwritten] k. [kollektsija = coll.] A. Jakovleva [nomin. A. Jakovlev]" [printed], "SYNTYPUS [printed in red] *Dolerus lucens* ANDRÉ, 1880 [handwritten] teste A. Taeger 20[printed]18 [handwritten]" [white label with a red frame], "*Lectotypus* [printed] *Dolerus lucens* André, 1880 [handwritten] M.Heidemaa des. [printed]" [red label], "*Dolerus fumosus* Stephens, 1835 M.Heidemaa det." [white, printed], ZIN. Paralectotype: 1♂ with same original collecting labels as the lectotype, but the no. is "271" and "*Dolerus lucens* André (typ.)" [handwritten, probably by Ed. André]. Left forewing missing. HNHM.

The paralectotype of *D. lucens* mentioned above bears a lectotype label by L. Zombori ("Lectotypus ♂ *Dolerus lucens* [...] des. Zombori 1980"), but Zombori never published a lectotype designation. Although the paralectotype

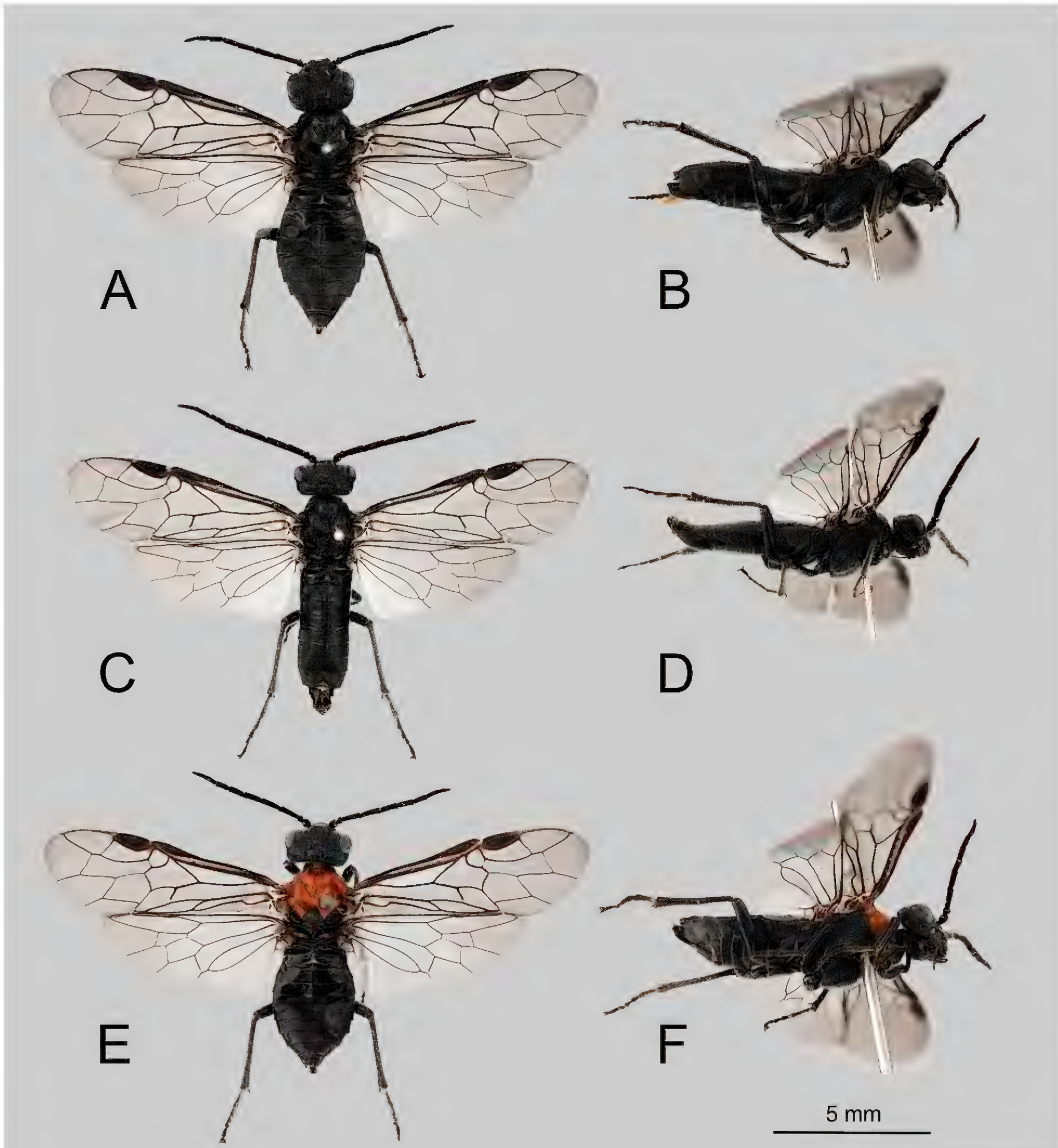

Figure 11. *Dolerus fumosus* Stephens, 1835 and *D. sanguinicollis* (Klug, 1818) habitus. **A, B.** *Dolerus fumosus* ♀ (ZMUO.039144); **C, D.** *D. fumosus* ♂ (ZMUO.045650); **E, F.** *D. sanguinicollis* ♀ (DEI-GISHym14001).

male has a handwritten label, most probably by André ("*Dolerus lucens* André (typ.)", Fig. 12I) and its penis valve is dissected, another syntype male (the right forewing and flagellum missing) is selected as the lectotype because it is deposited in André's collection (in ZIN), with many other type specimens of species described by him.

The holotype female of *D. sanguinicollis* var. *reicherti* has reddish lateral mesoscutal lobes and median mesoscutal lobes only slightly reddish on the anterior part, but according to the other diagnostic characters mentioned above, it belongs to *D. fumosus*.

Dolerus sanguinicollis (Klug, 1818)

Figs 11E, F, 12B–D, F, H

Note. *Tenthredo* (*Dolerus*) *sanguinicollis* Klug, 1818: 305. ♀ [not explicitly stated, but indicated by colour characters]. Syntypes. Published type locality: Austria. Lectotype ♀ hereby designated, labelled: "14222" [printed], "Austr. Kl." [Type locality: Austria, Carinthia, Klagenfurt], "*sanguinicollis* Kl.", "Lectotypus" [printed in block letters] ♀ 2014 [handwritten] *Tenthredo* (*Dolerus*) *sanguinicollis* Klug, 1818 [handwritten], "Des. M.Heidemaa" [red label],

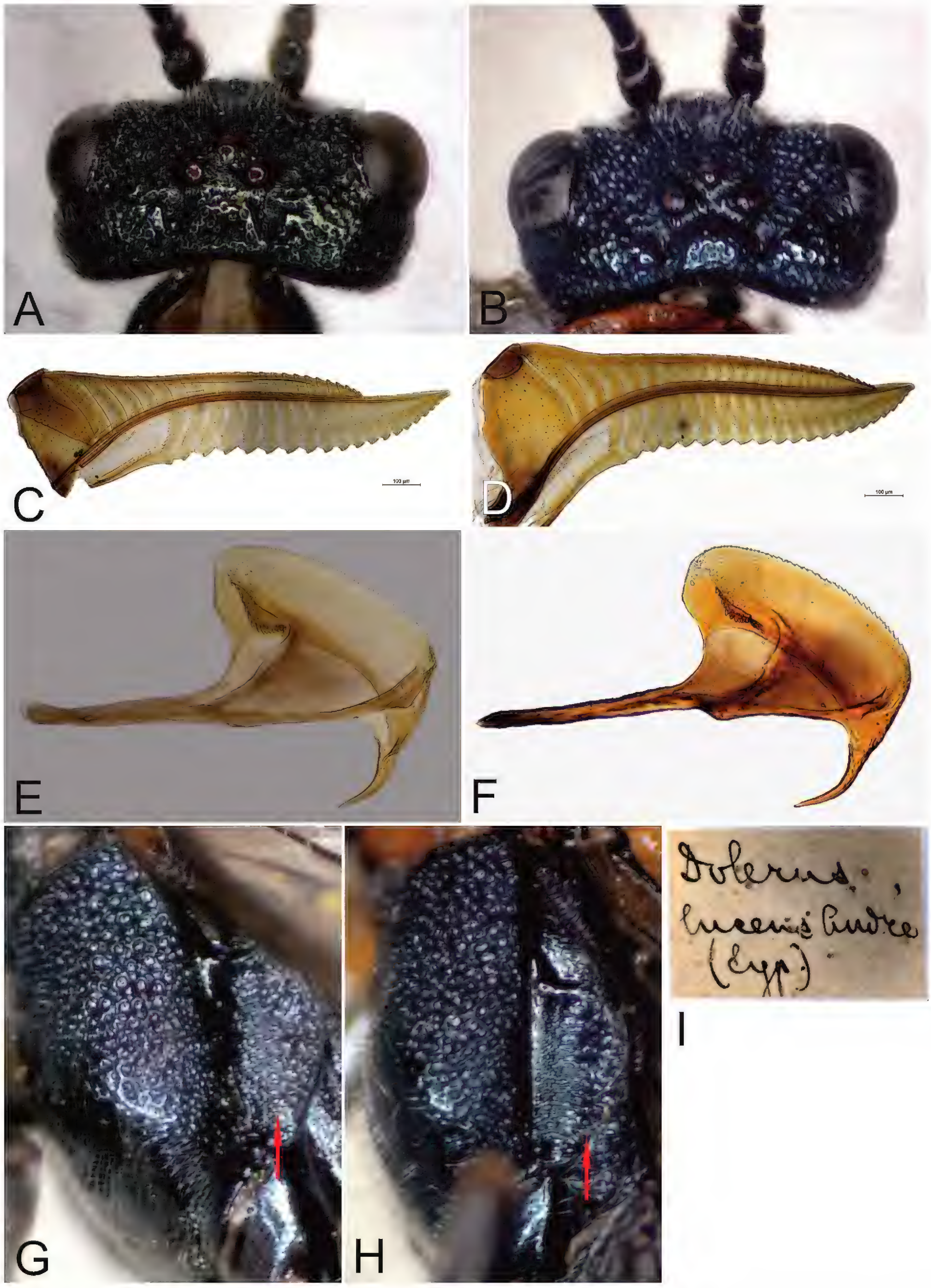

Figure 12. *Dolerus fumosus* Stephens, 1835 and *D. sanguinicollis* (Klug, 1818). **A.** *D. fumosus* head dorsal; **B.** *D. sanguinicollis* head dorsal; **C.** *D. fumosus* ovipositor; **D.** *D. sanguinicollis* ovipositor; **E.** *D. fumosus* penis valve; **F.** *D. sanguinicollis* penis valve. **G.** *D. fumosus* katepimeron (arrow); **H.** *D. sanguinicollis* katepimeron (arrow); **I.** *Dolerus lucens* André, paralectotype ♂, label probably written by André.

"GBIF-GISHym 2343", "Zool. Mus. Berlin" [printed], "*Dolerus sangunicollis* (Klug, 1818) M.Heidemaa det.". Minor damage. 2♀ (same collecting data) labelled as paralectotypes (GBIF-GISHym: 2344, 2345). All in ZMHB.

The taxonomy of *Dolerus pratensis* (Linnaeus, 1758) and *D. timidus* (Klug, 1818)

We propose that *D. pratensis* auct. includes two distinct species: *D. pratensis* (L.) and *D. timidus* (Klug) (Figs 13–15). The holotype male of *Tenthredo* (*Dolerus*) *deserta* Klug, 1818 and the syntype males of *T.* (*D.*) *dubia* Klug, 1818, and *T.* (*D.*) *timida* Klug, 1818 form two groups based on the structure of their penis valves. The lectotype female of *Dolerus pratensis* (Linnaeus, 1758) corresponds with the holotype male of *T.* (*D.*) *deserta* (penis valve as in Fig. 15A) based on the color pattern of its abdomen (basal terga 1–2 black in ♀) and the legs (hind legs extensively reddish). A different form of penis valve (Fig. 14A) fits some of the syntype males of *T.* (*D.*) *timida* and *T.* (*D.*) *dubia* (tergum 1 black in ♀). The melanic form named *D. variator* Enslin, 1927 (described from the Russian Far East), hitherto mostly considered to be a synonym of *D. pratensis*, probably represents a distinct species (penis valve as in Fig. 14B).

1 **a** Metepimeron almost evenly sculptured and matt (Fig. 14D) **b** In ♀ usually tergum 1 black (Fig. 13C, D, in ♂ tergum 1 or 1–2 black (abdomen completely black in the melanic colour form, see Remarks) **c** ♀ hind tibia blackish (Fig. 13C, D) and ♂ hind tibia from reddish to dark **d** Ventral margin of valviceps sligthly bowed and the angle between valvura and valviceps clearly obtuse, closer to a straight angle (Fig. 14A) **e** Lancet as in Fig. 14E ..... *D. timidus* (Klug, 1818) (= *dubius*)

– **aa** Metepimeron unevenly sculptured, at least partly more or less glossy (Fig. 14C) **bb** In both sexes terga 1–2 black (tergum 2 at least partly) (Fig. 13A, B) **cc** Hind legs extensively reddish in both sexes (Fig. 13A, B) **dd** Ventral margin of valviceps distinctly bowed and the angle between valvura and valviceps only slightly obtuse (Fig. 15A) **ee** Lancet as in Fig. 14F ..... *D. pratensis* (Linnaeus, 1758) (= *desertus*)

Genetics. *Dolerus pratensis* (BOLD:ACE4340) and *D. timidus* (BOLD:ACF0757) also separate based on COI sequences, with a minimum distance of 2.9% (full barcodes). Closest to *D. timidus* and *D. pratensis* are two BIN clusters of *D. gessneri* (minimum divergence in both cases 1.2%).

Dolerus pratensis (Linnaeus, 1758)

Figs 13A, B, 14C, 14F, 15

Tenthredo pratensis Linnaeus, 1758: 556. Sex not given. Syntypes (assumed). Lectotype ♀ designated by Malaise and Benson (1934). Type locality: Europe.

Tenthredo (*Dolerus*) *deserta* Klug, 1818: 300–301. ♂. Holotype. Published type locality: "In hiesiger Gegend gefunden" [meaning the environs of Berlin, Germany].

Type material examined and taxonomic notes. *Tenthredo pratensis* Linnaeus, 1758. Lectotype. LSUK. Images of the lectotype (LINN 2501) in dorsal and lateral view and the labels are available (The Linnean Society of London 2022), but we did not examine the specimen itself.

Tenthredo (*Dolerus*) *deserta* Klug, 1818. Holotype (GBIF-GISHym 2316; Fig. 15). Good condition, genitalia dissected and pinned with the specimen. ZMHB.

Dolerus timidus (Klug, 1818), sp. rev.

Figs 13C, D, 14A, 14D, 14E

Tenthredo (*Dolerus*) *timida* Klug, 1818: 300. ♀, ♂. Syntypes. Published type locality: "Deutschland" [Germany]. Lectotype designated below.

Tenthredo (*Dolerus*) *dubia* Klug, 1818: 299–300. ♀, ♂. Syntypes. Type locality: Germany. Lectotype designated below. Primary homonym of *Tenthredo dubia* Ström, 1768 [= *Tenthredo* (*Tenthredella*) *livida* Linnaeus, 1758].

Dolerus dubius var. *atratus* Enslin, 1913: 159. ♂. Syntypes (assumed). Type locality: Switzerland. Lectotype designated below.

Type material examined and taxonomic notes. *Tenthredo* (*Dolerus*) *timida* Klug, 1818. Lectotype ♂ hereby designated, labelled: "14199" [printed catalog no.], "Var. *T. timida* Kl. [Klug's handwriting]", "GBIF-GISHym 2317", "Zool. Mus. Berlin" [printed], "*Lectotypus* [printed] ♂ *Tenthredo* (*Dolerus*) *timida* Klug, 1818 [handwritten in block letters] M.Heidemaa design. [printed]" [red], "*Dolerus timidus* (Klug, 1818) M.Heidemaa det." [printed]. Good condition, penis valve dissected, pinned with the specimen (Fig. 14A). Paralectotypes: 4♂ 5♀ (GBIF-GISHym: 2312, 2318, 2320–2326). All in ZMHB.

Tenthredo (*Dolerus*) *dubia* Klug, 1818. Lectotype ♂ hereby designated, labelled: "14198" [catalog no.], "*Dolerus pratensis* (L.) ♂ [handwritten] det. F. Koch [printed]", "GBIF-GISHym 2315" [printed], "Zool. Mus. Berlin" [printed], "*Lectotypus* [printed] ♂ *Tenthredo* (*Dolerus*) *dubia* Klug, 1818 [handwritten in block letters] M.Heidemaa design. [printed]" [red], "*Dolerus timidus* (Klug, 1818) M.Heidemaa det." [printed], Condition satisfactory, genitalia dissected, penis valves on a slide pinned with the specimen (they fit *D. timidus*). Paralectotypes: 1♂, 1♀ ("GBIF-GISHym 2313", "… 2314"). All in ZMHB.

Dolerus dubius var. *atratus* Enslin, 1913. Lectotype ♂ hereby designated, labelled: "Helvet.[ia]", "Type" [pink, printed], "*Dolerus* ♂ *dubius* var *atratus* [handwritten] Dr. Enslin det. [printed]", "Sammlung Dr. Enslin" [printed], "GBIF-GISHym 3102", "LECTOTYPE ♂ *Dolerus dubius* var. *atratus* Enslin, 1913 designated M. Heidemaa 2022" [red, printed]. Some damage: left flagellum missing, abdomen glued to a card together with the dissected penis valves and pinned with the specimen. ZSM.

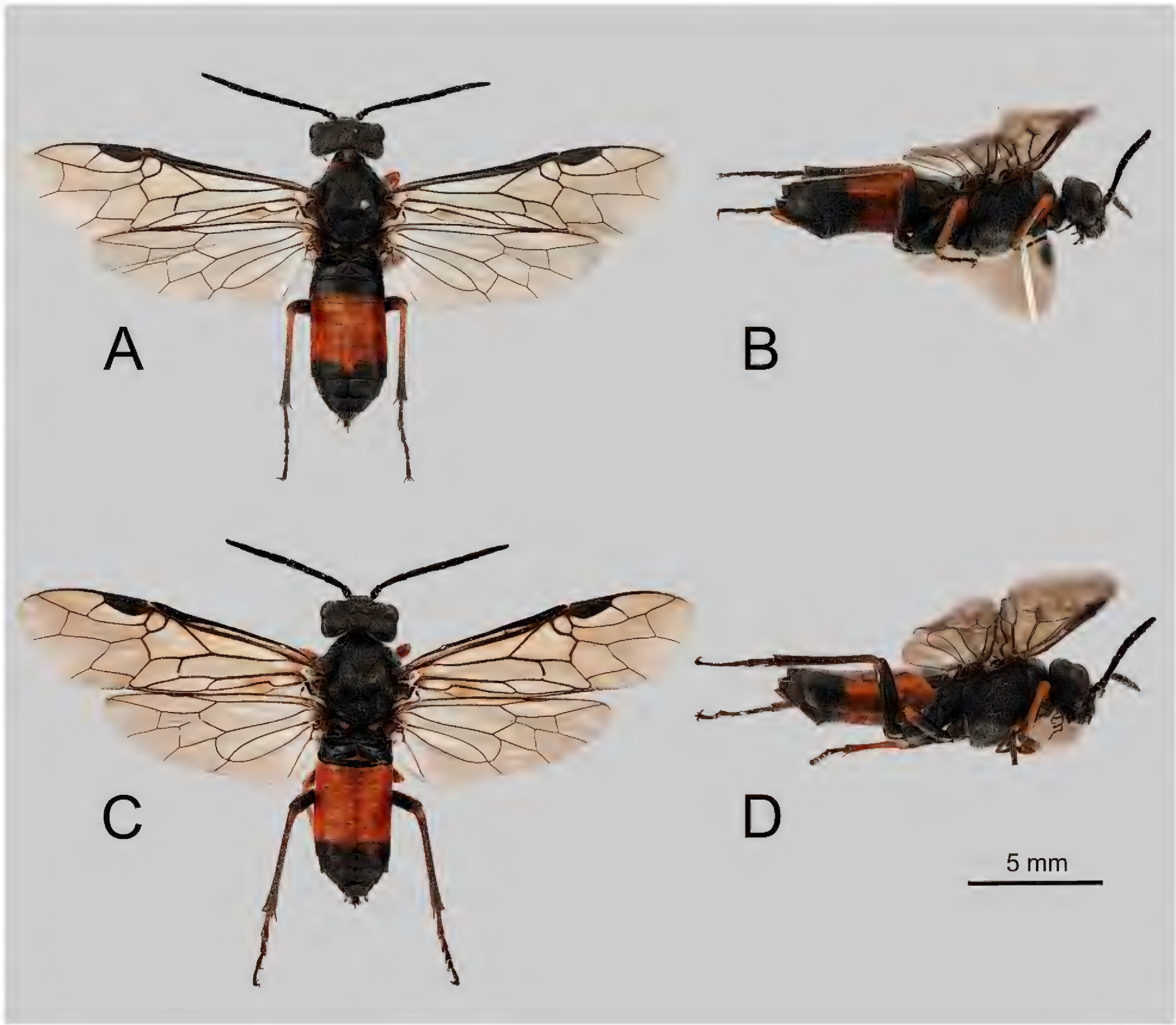

Figure 13. *Dolerus pratensis* (Linnaeus, 1758) ♀ (ZMUO.045279). **A.** Dorsal habitus; **B.** Lateral habitus. *Dolerus timidus* (Klug, 1818) ♀ (ZMUO.032881); **C.** Dorsal habitus; **D.** Lateral habitus.

This melanic color form was identified as *D. timidus* based on its penis valve structure and the sculpture of the metepimeron.

The taxonomy of the *Dolerus varispinus* complex

The dissertation by Heidemaa (2004) contained a disclaimer (ICZN, 1999: 8.2.) excluding taxonomic and nomenclatural results for the purposes of zoological nomenclature, because some results concerning *Dolerus* species were still preliminary, or in the process of being published. The work also lacked an identification key to this species complex (only one specimen of *D. schneideri* auct. was known to him at the time). Molecular markers have not yet been used to test whether *D. schneideri* auct. is a color form of *D. schmidti*, or a distinct species. COI barcoding does not separate *D. liogaster* and *D. schmidti*, but at least the clusters based on ITS1 markers correspond with the delimitation of *D. liogaster*, *D. schmidti*, and *D. varispinus* based on morphology. In addition, differences in the flight periods of the imagines of these species, based on some hundreds of specimens, were also detected by Heidemaa (2004), suggesting some difference in their phenology (the females and males of the same species showed congruent shifts). In the eastern Palaearctic the situation is further complicated because at least one, but possibly more similar species with a red-marked thorax occur there, e.g. *D. manticatus* Konow, 1907. This resembles the red-marked form of *D. liogaster*, but the upper part of the mesepisternum is additionally reddish. At present this species complex is taxonomically only partly resolved and more sequence data for some rarely collected taxa/forms are necessary. In some cases, specimens of the closely related and sympatric species, *D. schmidti* and *D. liogaster*, cannot be separated reliably without dissecting their penis valves or ovipositors. The identification of the more southern "*D. schneideri*" specimens, e.g. from the Czech Republic (Macek 2008) and Italy (Pesarini 1997, 2012), has to be checked: they are likely to refer to either *D. liogaster* or *D. schmidti*.

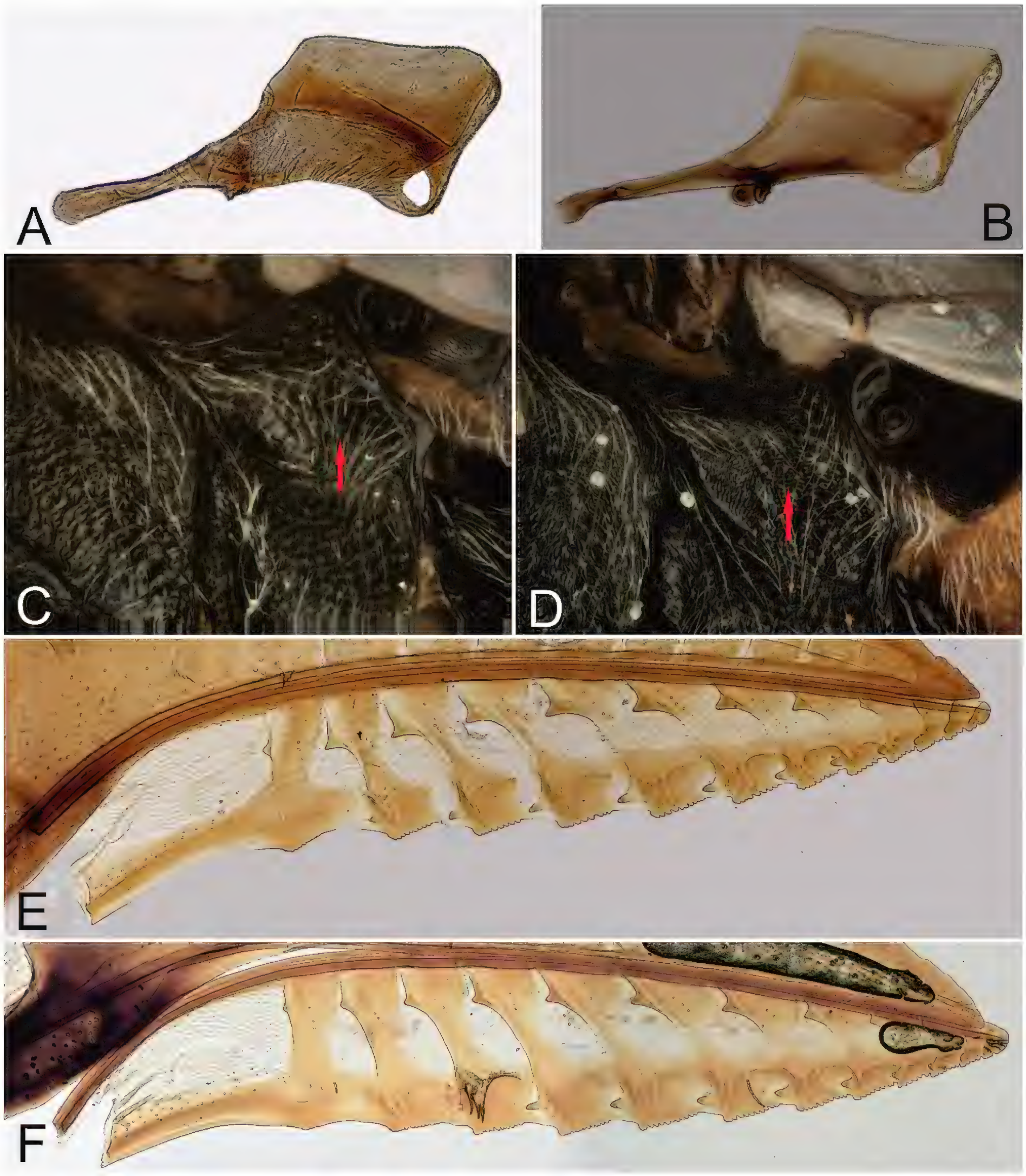

Figure 14. *Dolerus timidus* (Klug, 1818), *D. variator* Enslin, 1927 and *D. pratensis* (Linnaeus, 1758). **A.** Penis valve, lectotype *Tenthredo timida*; **B.** Penis valve, *D. variator*; **C.** Metepimeron (arrow), *D. pratensis* (ZMUO.032881); **D.** Metepimeron (arrow), *D. timidus* (ZMUO.029409), mirrored; **E.** Lancet, *D. timidus*; **F.** Lancet, *D. pratensis*.

Key to the *Dolerus varispinus* complex

1	**a** Females	2
–	**aa** Males	7
2(1)	**a** Legs extensively reddish (at least femora)	6
–	**aa** Legs black without extensive reddish color (at most femora at apex brownish)	3
3(2)	**a** Pronotum and median mesoscutal lobes completely red (sometimes reddish patches on mesepisternum, tegulae from red to blackish)	4
–	**aa**Thorax almost black (sometimes reddish patches on median lobes or elsewhere)	5

4(3) **a** Head behind eyes (dorsal view) about 1.3× as long as the length of eye (Fig. 16A) **b** Metepimeron flat and mostly matt (Fig. 16C) **c** SC_1 of fore wing usually reduced, pale (Fig. 16E) ..... *D. liogaster* Thomson, 1871 (*D. schneideri* Kiaer)

– **aa** Head behind eyes about as long as the length of eye (Fig. 16B) **bb** Metepimeron more or less convex and partly glossy (Fig. 16D) **cc** SC_1 of fore wing usually sclerotized, dark (Fig. 16F). *D. schmidti* Konow, 1884 (*D. schneideri* auct. partim)

5(3) **a** Sculpticells on anterior half of katepimeron of mesopleuron bead-like, uniformly raised, at least with some distinct pits (without worm-like sculpticells) (Fig. 16J) **b** SC_1 of forewing fully sclerotized, dark (Fig. 16G) **c** Cerci blackish **d** Antennae somewhat shorter: about as long as head and thorax together ..... *varispinus* Hartig, 1837

– **aa** Sculpticells on anterior half of katepimeron of mesopleuron worm-like, pits mostly indistinct or absent (Fig. 16H) **bb** SC_1 of forewing weakly sclerotized, pale (16E); **cc** Cerci yellowish or brownish **dd** Antennae clearly longer than head and thorax together ..... *D. liogaster* Thomson, 1871 (melanic form with black legs)

6(2) **a** Metepimeron almost flat, more or less uniformly sculptured and without convex sparsely pitted glossy region (Fig. 16C) **b** Basal serrulae (3–4) shorter, mostly with 9–12 denticles (Fig. 16K) **c** Worm-like sculpticells on anterior half of katepimeron of mesopleuron rough and irregular (Fig. 16H) **d** SC_1 on forewing pale, membraneous (reduced) (Fig. 16E) **e** Clypeus emargination almost round, its depth almost 0.4–0.5 of clypeus length (Fig. 16Q) **f** Cerci usually yellowish or yellowish brown ..... *D. liogaster* Thomson, 1871 (the most common colour form with partly reddish legs)

– **aa** Metepimeron more or less convex with glossy central region (pits and sculpture almost absent there) (Fig. 16D) **bb** Basal serrulae (3, 4) longer, mostly with 14–20 denticles (Fig. 16L) **cc** Worm like sculpticells on anterior half of katepimeron of mesopleuron finer (Fig. 16I) **dd** SC_1 on forewing sclerotized (blackish) (Fig. 16F) **ee** Clypeus emargination somewhat triangular, depth 0.25–0.35 of clypeus length (Fig. 16R) **ff** Cerci usually mostly brownish or blackish ..... *D. schmidti* Konow, 1884

7(1) **a** Worm-like sculpticells on katepimeron of mesopleuron present (Fig. 16H, I) **b** Apex of profemur mostly brownish. **c** Penis valve valvispina distinct and tooth-like, pointing more or less downwards (Fig. 16N, O) 8

– **aa** Worm-like sculpticells on katepimeron of mesopleuron absent (Fig. 16J) **bb** Legs completely black **cc** Penis valve valvispina very thin, somewhat bent and pointing more or less backwards (Fig. 16P) ..... *D. varispinus* Hartig, 1837

8(7) **a** Penis valve with dorsoapical part of valviceps wide, the tip of valvispina is nearly at the level of ventral margin of valviceps or below it (Fig. 16N) **b** Clypeus emargination wide, its depth 0.4–0.5 of its maximal length (Fig. 16Q) **c** Worm-like sculpticells on katepimeron of mesopleuron distinct, mostly with some larger pits ..... *D. liogaster* Thomson, 1871

– **aa** Penis valve with dorsoapical part of valviceps narrow, the tip of valvispina distinctly higher than the level of ventral margin of valviceps (Fig. 16O) **bb** Clypeus emargination depth 0.25–0.35 of its maximal length (Fig. 16R) **cc** Worm-like sculpticells on katepimeron of mesopleuron mostly indistinct, its anterior part mostly densely pitted with fine pits (Fig. 16I) ..... *D. schmidti* Konow, 1884

Dolerus liogaster Thomson, 1871

Fig. 16A, C, E, H, K, N, Q

Dolerus liogaster Thomson, 1871: 286. ♀, ♂. Syntypes. Type locality: Sweden. Lectotype designated below.

Dolerus schneideri Kiaer, 1898: 62–63. ♀, ♂. Syntypes. Type locality: Tromsø. Lectotype designated below.

? *Dolerus truncatus* Lacourt, 1988: 233–235. ♂. Holotype. Type locality: France, Alpes-Maritimes, Vallée de la Minière. CTN.

Type material examined and taxonomic notes. *Dolerus liogaster* Thomson, 1871. Lectotype ♂ hereby designated, labelled: "Lp. in." [?Lapland], "LECTOTYPUS [printed] *Dolerus liogaster* ♂ Thomson, 1871 [handwritten in block letters] design. 1999 M. Heidemaa and M. Viitasaari [printed]" [red], "*Dolerus liogaster* ♂ [handwritten] M.Heidemaa det. [printed]" [white]. Penis valves dissected, pinned with the specimen. Paralectotypes: 2♀, 1♂. All in MZLU.

Dolerus schneideri Kiaer, 1898. Lectotype ♀ hereby designated, labelled: "Tromsö 22.6.77", "lget expl" [spelling doubtful], "Ex coll. H. Kiaer" [printed], "261" [yellow], "LECTOTYPUS [printed] *Dolerus schneideri* ♀ Kiaer, 1898 [handwritten in block letters] design. 1999 M. Heidemaa and Viitasaari" [printed (excl. year), red], "*Dolerus liogaster* ♀M. Heidemaa det." [printed label]. Ovipositor dissected and pinned with the specimen, right antenna missing. Paralectotypes: 2♀. All in ZMUN.

The synonymy of *D. schneideri* with *D. liogaster* was first proposed by Lindqvist (1943). Treated here as a color form of *D. liogaster*, but still separated in the key, because the melanic color form of *D. liogaster* also has black legs, and *D. schmidti* has a color form with a red-marked thorax. Specimens resembling *D. schneideri* are also known from the mountain areas of Central Europe, e.g. from Switzerland at altitudes of 1500–1700 m (Benson 1961).

Dolerus truncatus Lacourt, 1988. The holotype (CTN) was studied. Its clypeus emargination looks as if it is abnormally developed. The penis valve (Fig. 18) appears to be somewhat distorted, perhaps during preparation, but resembles the valve of *D. liogaster*. Tentatively, we treat *D. truncatus* as a junior synonym of *D. liogaster*.

Dolerus schmidti Konow, 1884

Fig. 16B, D, F, I, L, O, R

Dolerus schmidti Konow, 1884: 350–351. ♀. Syntypes (assumed). Type locality: Hagen i. W. (Germany). Lectotype designated below.

Dolerus soniensis Dubois, 1920: 83–86, 94. ♀. Syntypes. Type locality: Uccle (Forêt de Soignes, La Cambre), Belgium. Lectotype designated below.

Figure 15. *Dolerus pratensis* (Linnaeus, 1758), holotype ♂ *Tenthredo deserta* Klug, 1818. **A.** Penis valve; **B.** Dorsal habitus.

Type material examined and taxonomic notes. *Dolerus schmidti* Konow, 1884. Lectotype ♀ hereby designated, labelled: "*Dolerus Schmidti* m. Hagen i/W.", "Typus" [red, printed], "Holotypus" [red, printed], "GBIF-GISHym4231" [printed], "Dolerus 199[printed]7 schmidti KONOW M. Heidemaa" [handwritten], "Eberswalde coll. DEI", "Coll. Konow", "LECTOTYPE ♀ *Dolerus schmidti* Konow, 1884 designated M. Heidemaa 2022" [red, printed]. Ovipositor dissected, gummed to a card and pinned with the specimen. SDEI.

Konow described *D. schmidti* as a new species only because *D. liogaster* Thomson was not known to him at the time. Later *D. schmidti* was treated as a variety of *D. liogaster* by Konow (1890b, 1898, 1905b) and synonymized with it by Enslin (1913). The lectotype female was wrongly interpreted as a holotype by Oehlke and Wudowenz (1984) and followed by Heidemaa (2004).

Dolerus soniensis Dubois, 1920. Lectotype ♀ hereby designated, labelled: "La Cambre Mai", "Collection Dubois", "*D. sonienis* ♀ det [handwritten] Ed. Dubois 19 [printed]", "*Dolerus soniensis* Dub ♀ [handwritten] Don et dét. [a gift and the determination by] Ed. Dubois 1920 [printed]", "*Type* [printed with red ink]" [a pale label with a red frame], "*Dolerus* 2000 [printed] *schmidti* KONOW [handwritten] M.Heidemaa det. [printed]", "*Lectotypus* ♀*Dolerus soniensis* Dubois, 1920 M.Heidemaa des." [printed white label with a red frame]. Ovipositor dissected and glued on a piece of card, pinned with the specimen. RBINS.

Dolerus varispinus Hartig, 1837

Fig. 16G, J, M, P, S

Dolerus varispinus Hartig, 1837: 239. ♀, ♂. Syntypes. Lectotype ♂ designated by Blank and Taeger (1992). Type locality: Germany [implicit from title of Hartig's work].

Dolerus rugosus Konow, 1884: 281. ♀, ♂. Syntypes. Type locality: Fürstenberg (Mecklenburg). Lectotype designated below. Junior primary homonym of *Dolerus rugosus* Freymuth, 1870.

Dolerus rugosulus Dalla Torre, 1894: 16. A replacement name for *D. rugosus* Konow.

Type material examined and taxonomic notes. *Dolerus varispinus* Hartig, 1837. Lectotype examined. ZSM.

Dolerus rugosus Konow, 1884. Lectotype ♂ hereby designated, labelled: "*Dolerus rugosus* m [mihi]. fbg. 4.84" (Fürstenberg / Mecklenburg, IV.1884) [with a double black frame], "*rugosus* D. T. [Dalla Torre]", "*Syntypus*" [red, printed]; "Lectotypus [printed] ♂ *Dolerus rugosus* Konow, 1884, design. M. Heidemaa and Viitasaari [printed] 1999 [handwritten]" [red label], "GBIF-GISHym 3770" [printed], "Coll. Konow" [printed], "Eberswalde coll. DEI" [printed], "*Dolerus* 1997 [printed] *varispinus* Hartig [handwritten] M. Heidemaa det. [printed]". SDEI. The taxonomic identity of the lectotype is certain despite its poor condition, because the katepimeron of the mesopleuron is preserved.

Notes on some other *Dolerus* species (Tenthredinidae, Selandriinae)

Dolerus bimaculatus (Geoffroy, 1785)

Tenthredo bimaculata Geoffroy in Fourcroy, 1785: 368, not 386 as given by Taeger et al. (2010). Sex not given. Syntypes (assumed). Type locality: France. The earlier description in French by Geoffroy (1762: 279, no. 16).

Tenthredo tristis Fabricius, 1804: 39. Sex not given. Syntypes (assumed). Type locality: Germany ("Habitat in Germania Dr. Panzer."). Lectotype designated below. Primary homonym of *Tenthredo tristis* Fabricius, 1779.

Type material examined and taxonomic notes. *Tenthredo tristis* Fabricius, 1804. Lectotype ♂ hereby designated, labelled: "*tristis*", "LECTOTYPE *Tenthredo tristis* Fabricius, 1775 [sic!] des. SMBlank 2008" [red, printed], "*Dolerus bimaculatus* (Geoff.) [handwritten] det. S.M.Blank 2008 ✓" [printed], "*Dolerus bimaculatus* (Geoffroy) M.Heidemaa det." [printed], "ZMUC-GISHym 1067". Left flagellum, right flagellomeres 6–7, left fore tarsomeres 4–5 missing. ZMUC.

Contrary to Fabricius' original description, the posterior half of tergum 2 is red in addition to terga 3–4.

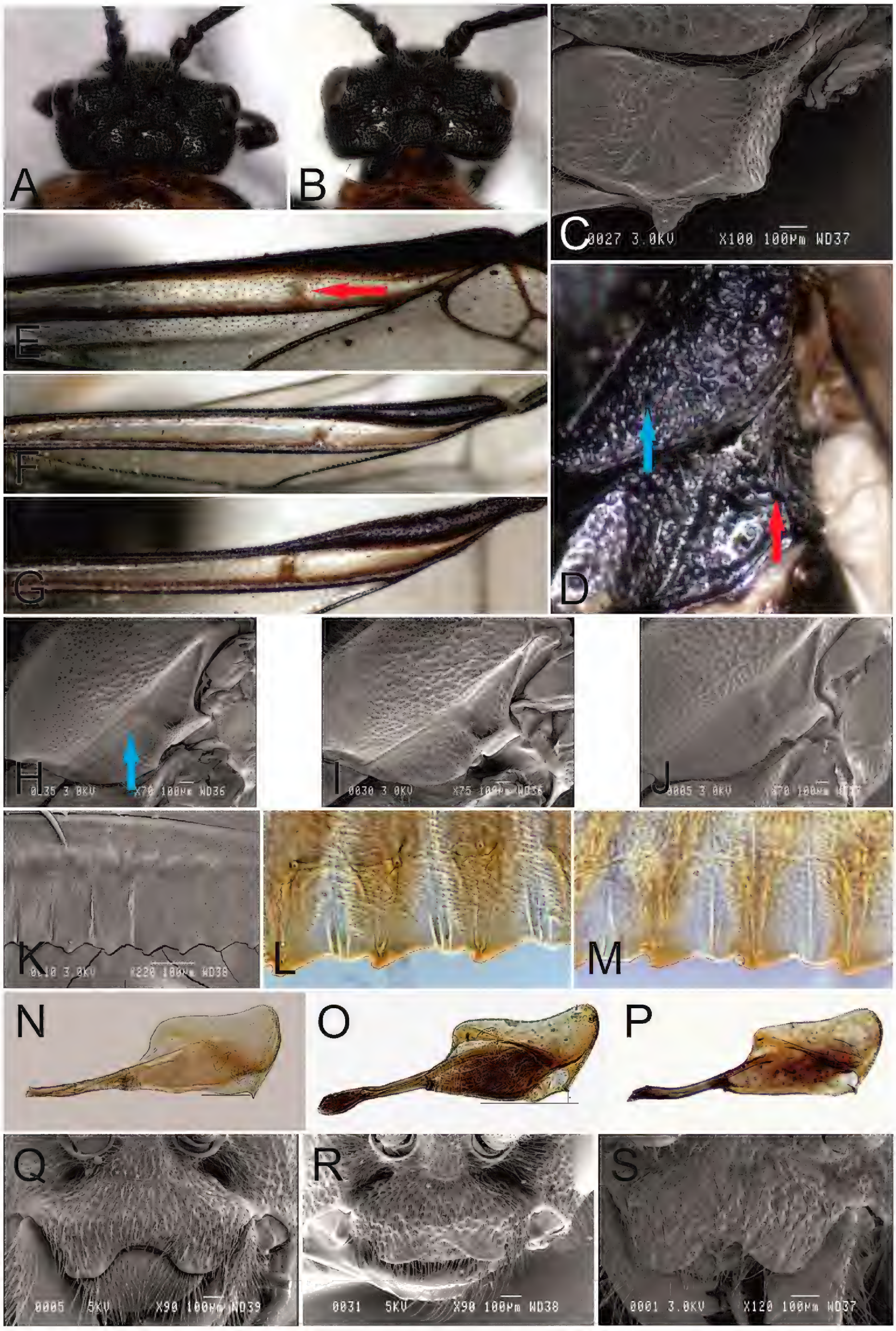

Figure 16. *Dolerus varispinus* complex. **A.** Head dorsal *D. liogaster* ♀; **B.** Head dorsal *D. schmidti* ♀; **C.** *D. liogaster* ♀ metepimeron; **D.** *D. schmidti* ♀ metepimeron (red arrow), katepimeron (blue arrow); **E.** *D. liogaster* fore wing SC_1 (arrow); **F.** *D. schmidti* fore wing SC_1; **G.** *D. varispinus* fore wing SC_1; **H.** *D. liogaster* ♀ katepimeron (arrow); **I.** *D. schmidti* ♀ katepimeron; **J.** *D. varispinus* ♀ katepimeron; **K.** *D. liogaster* serrulae; **L.** *D. schmidti* serrulae; **M.** *D. varispinus* serrulae; **N.** *D. liogaster* penis valve; **O.** *D. schmidti* penis valve; **P.** *D. varispinus* penis valve; **Q.** *D. liogaster* ♀ clypeus; **R.** *D. schmidti* ♀ clypeus; **S.** *D. varispinus* ♂ clypeus.

The application of the name *Tenthredo bimaculata* to this particular *Dolerus* species remains uncertain until the type material (syntype(s) in coll. E. L. Geoffroy, MNHN or Museum d'Historié Naturelle d'Autun, France?) should be located, or a neotype designated. The diagnosis by Geoffroy (1785) for *Tenthredo bimaculata* is uninformative: "deux taches blanches au corcelet", but based on the description by Geoffroy (1762) it was regarded as a possible senior synonym of *D. tristis* (F.) by de Dalla Torre (1894). Konow (1897a, 1905b) subsequently affirmed this synonymy.

Dolerus coruscans Konow, 1890 sp. rev.

Fig. 17A–H

Dolerus varispinus sensu Konow, 1884: 351.

Dolerus coruscans Konow, 1890a: 10. Described by indication on the description of *Dolerus varispinus* sensu Konow, 1884 (above). ♀, ♂. Syntypes. Published type locality: not given. Lectotype designated below.

Dolerus nigrominutus Haris, 1998: 131–132. ♂. Holotype. Type locality: Budakeszi Hârsbokorhegy (Hungary). Apex of abdomen missing, genitalia dissected and pinned with the specimen. Paratypes: 3♂. All in HNHM. syn. nov.

Type material examined and taxonomic notes. *Dolerus coruscans* Konow, 1890. Fürstenberg/Mecklenburg [Germany]. Lectotype ♂ hereby designated, labelled: "*Dolerus varispinus* Htg fbg. [Fürstenberg] 4.84." [Type locality: Germany, Brandenburg, Fürstenberg], "*Dolerus coruscan*s Knw.", "Type" [red, printed], "*Syntypus*" [red, printed], "Coll. Konow" [printed], "GBIF-GISHym 3762" [printed], "Lectotypus [printed] ♂ *Dolerus coruscans* Konow, 1884 M.Heidemaa design. '22", "*Dolerus* [printed] ♂ *coruscans* Konow, 1890 [handwritten in block letters] M.Heidemaa det. [printed]". Antennomeres 5–9 missing, genitalia dissected, pinned with the specimen. SDEI. Paralectotype: 1♀ (GBIF-GISHym 3761), Germany, Schönberg [probably Brandenburg]. Here determined as *D. anthracinus*. SDEI.

Oehlke and Wudowenz (1984) correctly linked *D. coruscans* Konow, 1890 to the description of *D. varispinus* Hartig sensu Konow, 1884, but following the definitions used in the Code (ICZN 1999), they were wrong in categorizing it as a nomen novum proposed as a replacement for a previously existing name. *Dolerus coruscans* was, in fact, described as a new species, by indication on the description by Konow (1884). Konow (1890a) altered his opinion on his 1884 identification of *D. varispinus*, and stated that this taxon represented *D. anthracinus* sensu Thomson. Goulet (1986) followed Konow's 1890 opinion, but this cannot be accepted, because Konow clearly based his 1884 description on material in his own collection, not in Thomson's collection. Although *D. coruscans* was later synonymized (Enslin 1909) with *D. nitens* Zaddach, it has been used in published works more than once as a valid name since 1899 (e.g. Dittrich 1905; Fedchenko 1905; Dalglish 1914) and cannot be treated as a *nomen oblitum*. However, it was listed as a synonym of *D. anthracinus* by Liston (1981), while Konow (1890b, 1905b) and Cameron (1893) regarded it as possibly conspecific with *D. possilensis* Cameron. A recent study of the syntypes of *D. coruscans* (♀, ♂) revealed that the penis valve of the lectotype male (Fig. 17A) is identical to *D. nigrominutus* Haris, 1998 (the holotype and two paratype males studied) but the penis valve drawing by Haris (1998) was apparently based on a deformed valve because the other valves examined (including those of the holotype) have no such distinct depression on the ventroapical margin near the valvispina. The paralectotype female of *D. coruscans* (see above) is probably a female (the only one known at present) of *D. anthracinus* Klug (nec auct.).

Characters of the female. The female of *D. coruscans*, based on two specimens, resembles *D. picipes* in many characters (the males are even more similar) and the melanic form of *D. liogaster* with black legs, but differs by its mostly smaller body size of 6–7 mm and the rather inconspicuous setation of the ovipositor sheath (valvula 3) (Fig. 17G). Due to their similarity, the diagnostic characters of *coruscans* are compared to their states in *picipes*.

Head. (Fig. 17B, C) Closely resembles *D. picipes*, but the minimal distance between the antennal sockets is about 2× the length of the malar space (clearly shorter in *picipes*). Pits on face and vertex more unevenly distributed and vary more in their size. Postocellar field less distinctly defined than in *picipes* and lateral postocellar furrows less distinct: short and pit-like, rather than long and line-like in *picipes*. Glossy patches beside the lateral postocellar furrows less distinct (almost no difference between the males).

Thorax. (Fig. 17D, E) The katepimeron of the mesopleuron (Fig. 17D) with more numerous and distinct pits than in *picipes*. The lateral mesoscutal lobes (Fig. 17E) less distinctly and rather sparsely pitted.

Abdomen. (Fig. 17F–H) The ovipositor sheath in dorsal view broadens slightly towards the apex (Fig. 17G). Cerci (Fig. 17H) yellowish (black in *picipes*, Fig. 17I). Setae on valvula 3 rather short and delicate compared to most other *Poodolerus* species (Fig. 17G, H). Setae on the abdominal terga shorter and sparser, except on the apical terga. The species can be easily differentiated from *D. picipes* as follows.

1 **a** Lateral postocellar furrows distinct: long and line-like **b** Minimal distance between the antennal sockets about 1.5× the length of malar space **c** Ovipositor sheath in dorsal view strongly broadening towards apex, the apical setae well developed and clearly curved (Fig. 17I) ..... *D. picipes* (Klug, 1818)

– **aa** Lateral postocellar furrows indistinct: short and pit-like (Fig. 17C) **bb** Minimal distance between the antennal sockets about 2× the length of malar space (Fig. 17B) **cc** Ovipositor sheath in dorsal view slightly broadening towards the apex, the apical setae delicate, nearly straight or slightly curved (Fig. 17G)..... *D. coruscans* Konow, 1890

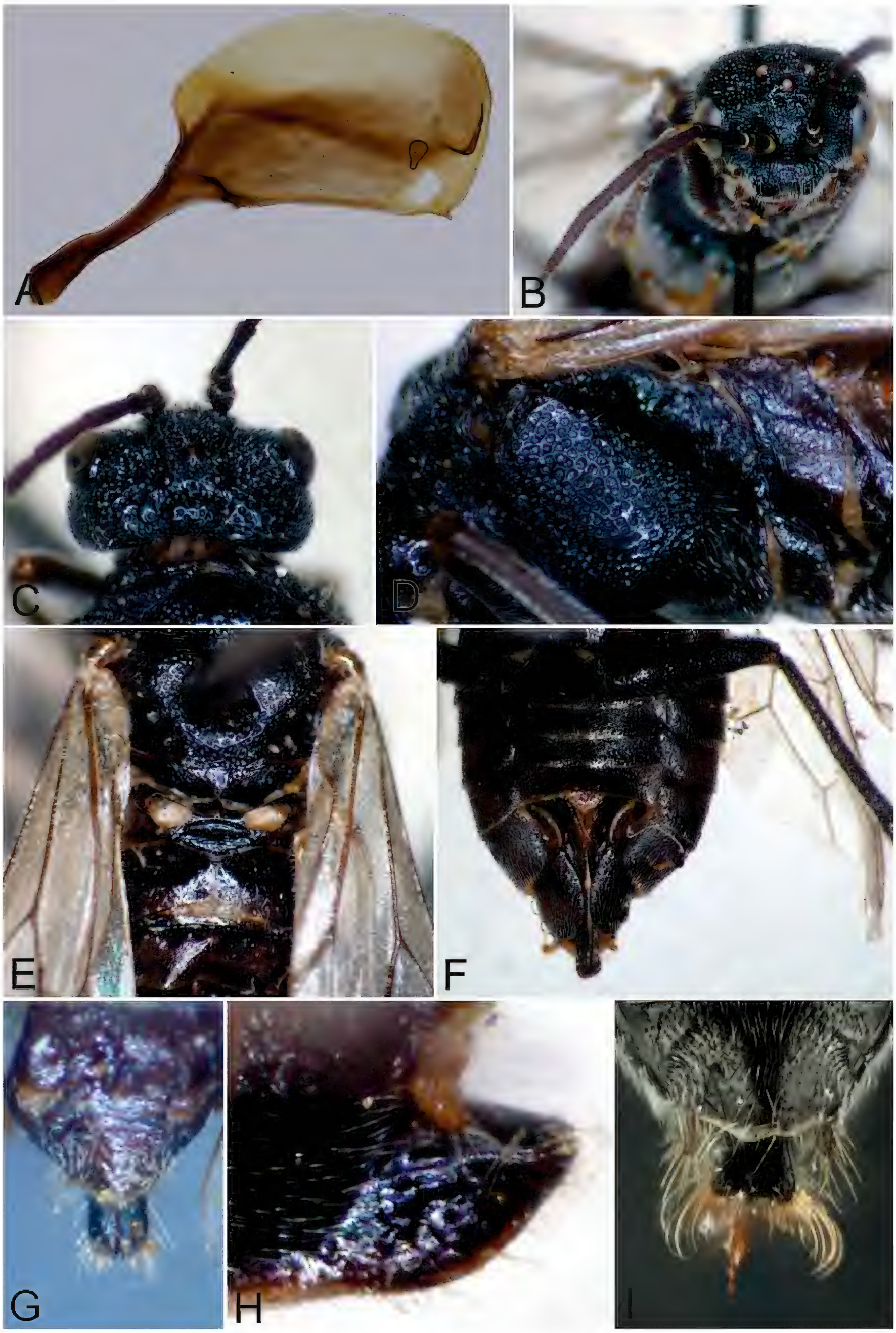

Figure 17. A–H *Dolerus coruscans* Konow, 1890; **A.** Lectotype ♂, penis valve; **B.** ♀ head frontal (Austria, Burgenland, SDEI); **C.** ♀ head dorsal (Hungary, HNHM); **D.** ♀ thorax lateral (Hungary, HNHM); **E.** ♀ thorax and base of abdomen (Hungary, HNHM); **F.** ♀ apex of abdomen ventral (Austria, Burgenland, SDEI); **G.** ♀ valvula 3 dorsal (Hungary, HNHM); **H.** ♀ valvula 3 lateral (Hungary, HNHM); **I.** *Dolerus picipes* (Klug, 1818). ♀ valvula 3 dorsal (ZMUO.045856).

Figure 18. *Dolerus truncatus* Lacourt, 1988, holotype (? = *D. liogaster*). Penis valve.

Distribution. *Dolerus coruscans* is recorded from Austria (N-Burgenland, Ungerberg, Weiden am See, 1♀, 24.03.1957, leg. F. Kasy, SDEI), Germany (lectotype: see above), Hungary ("Budapest", 1♀, SDEI. Haris 1998, 2003: "Budakeszi, Csepel, Látrány, Rákospalota"; Roller and Haris 2008: "Simontornya, Csévharaszt, Szécsény", in total 14♂), and Greece (Nom. Grevená, Kónitsa E 28 km Vasilítsa Ski Resort, 40.050°N, 21.050°E, 1780 m, 2♂, 11.05.2007, leg. S. M. Blank et al. / leg. M. Wei, SDEI. The records of *D. coruscans* from Austria and Greece are the first for these countries. The species apparently has a wide distribution, but is probably seldom collected because of its rarity and early flight period. Probably it has also sometimes remained unidentified, or has been misidentified. Possibly, the males of this species in collections could have been placed under *D. picipes* and its rather small females have perhaps been mistaken for dwarf females of *D. liogaster* / *D. puncticollis* (both species also have melanic color forms).

Remarks. Haris (2003) speculated that the female of this species might be wingless, or have reduced wings. Present data exclude this possibility. Nor does the female remain unknown, as Haris (1998) suggested it would, because of the destruction of the very small type locality of *D. nigrominutus*. In Central Europe *D. coruscans* has been collected early in the season (March–April).

Dolerus ferrugatus Serville, 1823

Dolerus ferrugatus Serville, 1823: 59. ♀. Syntypes. Type locality: Paris. Lectotype designated below.

Dolerus brevicornis Thomson, 1871: 288. ♀, ♂. Syntypes. Published type locality: "södra Sverige" [southern Sweden]. Lectotype designated below. Primary homonym of *D. brevicornis* Zaddach, 1859.

Dolerus thomsoni var. *miricolor* Konow, 1887a: 283. ♂. Syntypes (assumed). Type locality: Fürstenberg/ Mecklenburg. Lectotype designated below.

Type material examined and taxonomic notes. *Dolerus ferrugatus* Serville, 1823. Lectotype ♀ hereby designated, labelled: "Saint-Fargeau" [round], "Lectotype" [red, printed in block letters], "Lectotype *D. ferrugatus* LEP. ♀ det. A.Haris 1996", "*D. ferrugatus* LEP. ♀ det.: A.Haris", "*Lectotypus* [printed]♀ *Dolerus ferrugatus* Serville, 1823 [handwritten in block letters] M.Heidemaa design. [printed]" [red], "*Dolerus ferrugatus* Serville, 1823 M.Heidemaa det." [printed]. In good condition (the right flagellum missing). MNHN.

Dolerus brevicornis Thomson, 1871. Lectotype ♀ hereby designated (type locality: Sweden, Öland), labelled: "Ö." [Öland], "MZLU 2013 414" [green, printed (a loan record label)], "Lectotypus [printed] ♀ 2014 *Dolerus brevicornis* Thomson, 1871 [handwritten in block letters] M.Heidemaa des. [printed]" [red], "*Dolerus ferrugatus* Serville, 1823 M.Heidemaa det." [printed]. 2♀ (from Öland and Scania), 1♂ (the melanic form, from Lund) labelled as paralectotypes. All in MZLU.

Dolerus thomsoni var. *miricolor* Konow, 1887. Lectotype ♂ hereby designated, labelled: "f. [Fürstenberg] 12/4. [18]84.", "*Dolerus* v. [var.] *miricolor* Knw. [Konow] fbg. 12/4. 84. Typus" [with double black frame], "*Dolerus ferrugatus* Lep. f. *miricolor* Knw. Typus. ♂ det. OConde [Otto Conde] 1943", "Typus" [red, printed], "Holotypus" [red, printed], "Coll. Konow" [printed], "GBIF-GISHym 4215" [printed], "Lectotypus [printed] ♂ *Dolerus thomsoni* var. *miricolor* [handwritten in block letters] M.Heidemaa des. [printed]" [red], "*Dolerus ferrugatus* Serville, 1823 M.Heidemaa det." [printed]. Right flagellum missing, penis valves dissected (a microscope slide: Symphyta coll. Nr: 159). All in SDEI.

The melanic colour form of *D. ferrugatus*, described by Konow as *D. thomsoni* var. *miricolor*, has sometimes been mixed up with *D. pachycerus* Hartig, 1837. Apart from their different penis valves, they can be separated by the shape and the structure of the mesoscutellar appendage: long, concave at the sides, and with a distinct longitudinal keel in *D. pachycerus* compared with *D. ferrugatus*.

Dolerus germanicus (Fabricius, 1775)

Tenthredo germanica Fabricius, 1775: 321. ♀. Syntypes (assumed). Type locality: Germany ("Habitat in Germania."). Lectotype designated below.

Dolerus arcticus Thomson, 1871: 284–285. ♀, ♂. Syntypes. Type locality: "Lapland, Dalarna, Ångermanland". Type locality: Lapland. Lectotype designated below.

Dolerus cothurnatus Serville, 1823: 60. ♂. Syntypes. Type locality: Paris. Lectotype designated below. syn. nov.

Dosytheus fuscipennis Stephens, 1835: 85. Sex not given. Syntypes (assumed). Type locality: south of Scotland. Lectotype ♀ designated by Kirby (1882).

Dosytheus hyalinalis Stephens, 1835: 83. ♀, ♂. Syntypes. Type locality: Hertford (UK). Lectotype designated below. syn. nov.

Dosytheus xanthopus Stephens, 1835: 83–84. Sex not given. Syntypes (assumed). Type locality: Hertford (UK).

Type material examined and taxonomic notes. *Tenthredo germanica* Fabricius, 1775. Lectotype ♀ hereby designated, labelled: "*germanica*", "LECTOTYPE *Tenthredo germanica* Fabricius, 1775 des. SMBlank 2008", [red, printed], "ZMUC-GISHym 1050", "*Dolerus germanicus* (F.) [handwritten] det. S.M.Blank 2008 ✓" [printed],

"*Dolerus germanicus* (Fabricius) M.Heidemaa det." [printed], "ZMUC-GISHym 1043". Left flagellum, right fore tarsus, some additional distal tarsomeres missing. ZMUC.

Two specimens are present in the ZMUC collection under the name *Tenthredo germanica*. Klug (1819) referred to one of them, which has black legs and an infuscated tip of the abdomen ("Das vorhandene Exemplar hatte schwarze Beine und einen an der Spitze schwärzlichen Hinterleib, [...]"). This specimen is selected as the lectotype. It corresponds with the current concept of *Dolerus germanicus*, e.g. in the shape of the sawsheath (valvula 3) setation. The species needs a thorough revision, because DNA barcoding divides the specimens into two BINs (BOLD:AAI9736 and BOLD:ABV8027) separated by a minimum of over 5% divergence, indicating the possible presence of two distinct species. The two BINs are associated with color differences, of which some appear stable within the cluster and others are variable. Based on about 80 barcoded specimens from Finland, specimens of BOLD:ABV8027 consistently have entirely black hind legs, while those of BOLD:AAI9736 usually have largely orange hind femora and tibiae, although sometimes they are completely black. Additionally, females with a red mesoscutellum always fall in BOLD:AAI9736 and always have red tegulae, pronotum and mesoscutum, whereas in BOLD:ABV8027 the mesoscutellum is always entirely or mostly black, but the tegulae, pronotum and mesoscutum vary from black to red. It is also worth mentioning that the division of specimens into two groups was not reflected in two nuclear genes (POL2 and NaK). Likewise, no useful structural characters have yet been found, but a more detailed systematic study of the male genitalia might be helpful.

Dolerus arcticus Thomson, 1871. Lectotype ♀ hereby designated, labelled: "Lapp" [Lapland] [printed], "*arcticus* m[mihi]" [Thomson's handwriting], "MZLU 2013 421" [green, printed loan label], "Lectotypus [printed] ♀ 2014 *Dolerus arcticus* Thomson, 1871 [handwritten in block letters] M.Heidemaa des. [printed]" [red], "*Dolerus germanicus* (Fabricius) M.Heidemaa det." [printed]. Ovipositor dissected, glued on a piece of paper pinned below the specimen. Paralectotypes: 3♀ [MZLU 422, 424, 425], and 1♂ [MZLU 423]. All in MZLU.

Dolerus cothurnatus Serville, 1823. Lectotype ♂ hereby designated, labelled: [green, round, without text], "Lectotype" [red, printed in block letters], "*D. cothurnatus* LEP. Det.: A.Haris", "Lectotype *D. cothurnatus* LEP. Det.: A.Haris", "Lectotypus [printed] ♀[handwritten], 2014 *Dolerus cothurnatus* Serville, 1823 [handwritten in block letters] M.Heidemaa des. [printed]" [red label], "*Dolerus germanicus* (Fabricius, 1775) M.Heidemaa det." [printed]. Two paralectotype males were also examined: one of them is *D. germanicus*, the other is *D. aericeps*. All in MNHN.

A study of the penis valves of the three syntypes of *D. cothurnatus* revealed that two of them belong to *D. germanicus*, including the specimen here designated as the lectotype, and one to *D. aericeps*. These old specimens all have rather pale wings, but probably they have faded: *D. germanicus* and *D. junci* [=*cothurnatus* auct.] typically have darker wings. The specimen labelled by Haris as lectotype is designated here as a lectotype for *D. cothurnatus* Serville and *D. cothurnatus* is regarded as a synonym of *D. germanicus* (see above, under *Dolerus cothurnatus* auct. nec Serville, 1823).

Dosytheus fuscipennis Stephens, 1835. Lectotype ♀. Labelled: "Type H.T. [holotype]" [round with a red margin, printed], "B.M. TYPE HYM. [printed] 1.578.", "B.M. TYPE HYM. [printed] *Dosytheus fuscipennis* Stephens 1835.", "*fuscipennis*.", "*Dolerus pratensis*, L." [printed], "Stephens Coll. 53–46" [printed], "*Dolerus germanicus* (Fabricius) M.Heidemaa det." [printed]. Condition good, legs partly destroyed. BMNH.

The number of specimens was not given by Stephens. The species description should therefore be assumed to have been based on syntypes. However, Kirby (1882) referred to the "♀. (Type of *D. fuscipennis*.) S. Scotland. J. F. Stephens", and according to the labels and the collection catalogue this was the only specimen from the Stephens collection in the BMNH. The specimen fits the original description, and Kirby's statement qualifies as a valid lectotype designation, because there is no evidence in the original description that more than one type specimen existed (ICZN 1999 Article 74.6.).

Dosytheus hyalinalis Stephens, 1835. Lectotype ♀ hereby designated, labelled: "B.M. TYPE HYM [printed] 1.577.", "B.M. TYPE HYM [printed] *Dosytheus hyalinalis*. (Stephens 1835)", "*hyalinalis* Steph", "42 1b" [round], "*Dolerus pratensis*, L." [printed], "*Dolerus germanicus* (F.) M.Heidemaa det." [printed]. BMNH.

In the original description Stephens indicates that he had more than one specimen, because he gives color characters for both sexes. Kirby's statement "♀ Type of *D. hyalinalis*" (Kirby 1882) refers to the only syntype from the Stephens collection that was present in the BMNH, but cannot be accepted as a lectotype designation, because it is clear that Stephens based his description on more than one specimen (ICZN 1999 Article 74.5.). The synonymy with *D. pratensis*, based on a misidentification, was adopted for example by de Dalla Torre (1894) and most other subsequent works.

Dosytheus xanthopus Stephens, 1835. The only specimen found in the collection (BMNH) labelled as "*xanthopus*" and "B.M. TYPE 1.257." belongs to *D. germanicus*. It cannot be a syntype of *D. xanthopus*, because the specimen disagrees with the original description: its mesoscutellum is orange, not black as described, and the locality label ("Kent, Darenth, J. F. Stephens BM 1853 – 42", probably added by Benson) does not match the locality given by Stephens. Interestingly, it was labelled by Benson (handwritten): "*Dolerus etruscus*?".

Dolerus gessneri André, 1880

Fig. 19

Notes. *Dolerus Gessneri* [sic!] André, 1880: 273. Sex not given. Syntypes. Type locality: Switzerland. Lectotype

♀ hereby designated, labelled: "Suisse", "DEI GISHym 89367" [printed], "coll. Desbrochers [handwritten] k. [kollektsija = coll.] A. Jakovleva [nomin. A. Jakovlev]" [printed], "SYNTYPUS [printed in red] *Dolerus gessneri* ANDRÉ, 1880 [handwritten] teste A. Taeger 20[printed]18 [handwritten]" [white with a red frame]. "Lectotype Dolerus gessneri André 1880 vide A. Taeger 2022 des." [red, printed]. Good condition, but slightly dusty. Paralectotypes: 2♂ (one without flagella) with the same data (except "♂" [printed], "DEI-GISHym 89365" and "D… 89366" and "Paralectotypus" instead of "Lectotypus"). All in ZIN.

The color form of *Dolerus gessneri* with a red-banded abdomen was described as a distinct species, *D. labiosus* Konow, 1897 (Konow 1897b), but was later mostly treated as a synonym (sometimes also as a subspecies) of *D. gessneri*, because intermediate color forms with variable red markings on the abdomen occur. The specimens from the Russian Far East with completely black forelegs, which have sometimes been determined as *D. gessneri*, probably belong to some other *Dolerus* (subgen. *Equidolerus*) species. *Dolerus gessneri*, a Holarctic species, needs a revision, because COI barcoding data suggest that it could include more than one species, and some morphological characters correlate with the genetic data. There are three BIN clusters (BOLD:AAL2317, BOLD:ACE7304, BOLD:ACE3617) diverging by 1.8–2.3%. BOLD:AAL2317 is closest to *D. timidus* and BOLD:ACE7304 is closest to *D. pratensis* (minimum divergence in both cases 1.2%). All three BIN clusters are represented in Fennoscandia, two of which (Fig. 19) have been found in Finland.

Dolerus gonager (Fabricius, 1781)

Tenthredo gonagra Fabricius, 1781: 412. Sex not given. Syntypes (assumed). Type locality: "Habitat in Germaniae plantis." [Germany]. Lectotype designated below.

Dolerus femoratus Eversmann, 1847: 24–25. ♀. Syntypes. Type locality: Kasan (Russia, Taterstan). Lectotype designated below.

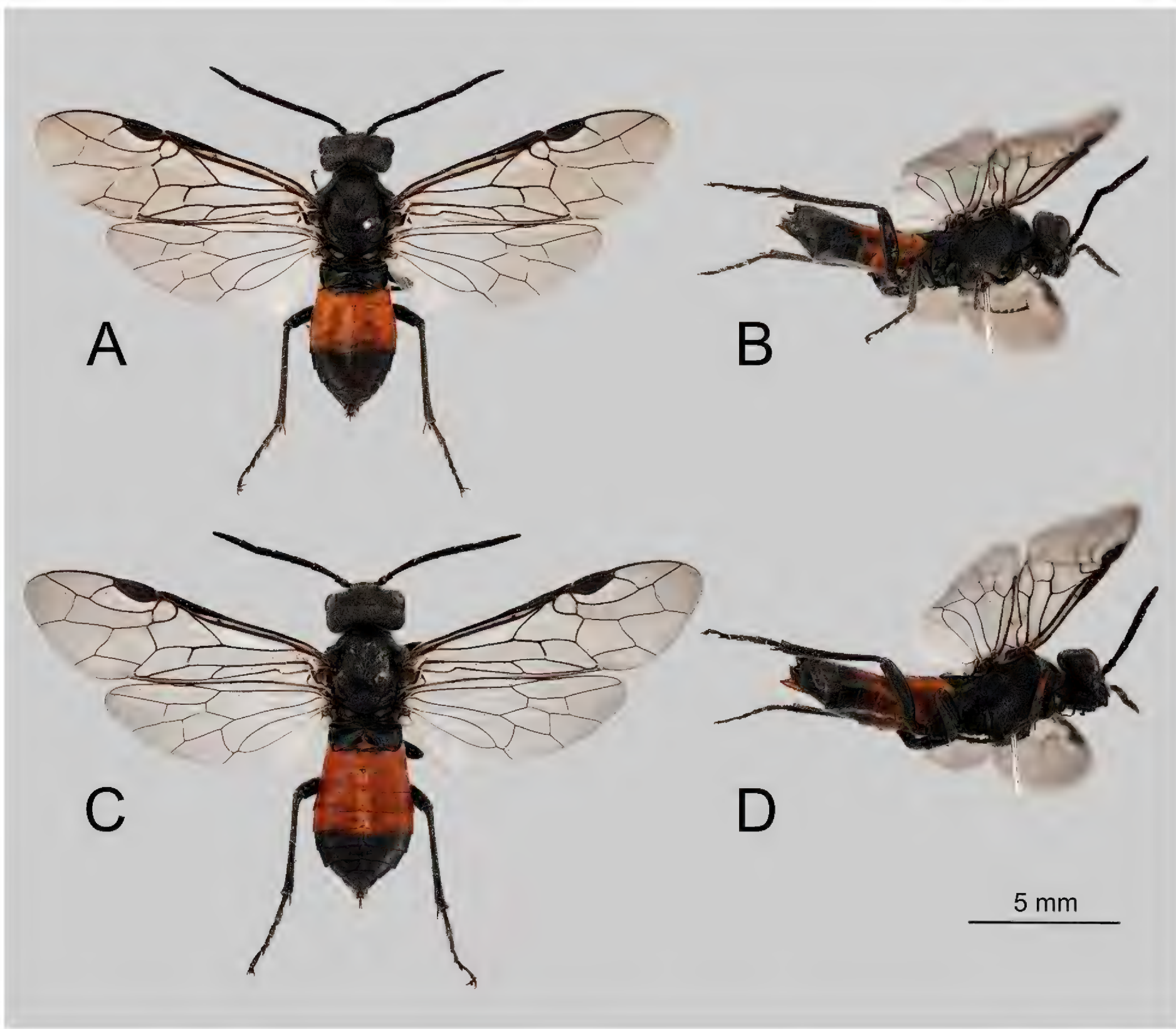

Figure 19. *Dolerus gessneri* (André, 1880) (ZMUO.045118). **A.** Dorsal habitus; **B.** Lateral habitus. *Dolerus* sp. near *gessneri* (ZMUO.045279); **C.** Dorsal habitus; **D.** Lateral habitus.

Dolerus magnicornis Eversmann, 1847: 25. ♂. Syntypes (assumed). Type locality: Russia, Orenburg Province. Lectotype designated below.

Type material examined and taxonomic notes. *Tenthredo gonagra* Fabricius, 1781. Lectotype ♀ hereby designated, labelled: "*gonagra*"; "LECTOTYPE *Tenthredo gonagra* Fabricius, 1781 des. SMBlank 2008" [red, printed: paralectotypes labelled in corresponding way], "ZMUC-GISHym 1050", "*Dolerus gonager* (F.) [handwritten] det. S.M.Blank 2008 ✓" [printed], "*Dolerus gonager* (Fabricius, 1781) M.Heidemaa det." [printed]. Right flagellomeres 6–7, right hind tarsus missing. Paralectotype 1♀: "*gonagra*", "ZMUC-GISHym 1051". ZMUC.

The type specimens correspond with Zhelochovtsev's definition of *Dolerus* (*Poodolerus*) *gonager*, which has red knees, superficially pitted lateral mesonotal lobes and backwards directed setae of the parallel-sided ovipositor sheath (similar to Zhelochovtsev 1994: fig. 165.2, but with some of the longest hairs curved distally).

Dolerus femoratus Eversmann, 1847. Lectotype ♀ hereby designated, labelled: "Kas[an] 16.V.", "*femoratus*. Kl." [with black frames], "DEI-GISHym 30068" [white, printed], "Lectotype Dolerus femoratus Eversmann 1847 vide A. Taeger 2014 des." [red, printed]. In good condition. Belongs to *D. gonager*. Paralectotypes: 2♀ (DEI-GISHym 30069, 30070), are *D. puncticollis* Thomson, 1871. All in ZIN.

Dolerus magnicornis Eversmann, 1847. Lectotype ♂ hereby designated, labelled: "Orb" [Orenburg], "magnicornis mihi" [with black frames], "DEI-GISHym 30067" [white, printed], "Syntype Dolerus magnicornis Eversmann 1847 vide A. Taeger 2014" [red, printed], Lectotype Dolerus magnicornis Eversmann 1847 M.Heidemaa des." [red, printed]. In good condition. Belongs to *D. gonager*. ZIN.

Dolerus incisus Goulet, 1986

Fig. 20A–C

Notes. Finland: Regio kuusamoensis, Kuusamo Siikauopaja, YKJ grid coordinates: 7362:3612 [66.334°N, 29.511°E], 2♀ (ZMUO.035155, ZMUO.035156), 12.06.2018. 1♀ (ZMUO.045265), 20.06.2020. All specimens leg. M. Mutanen. ZMUO.

First record in the Palaearctic. Recorded previously only in boreal North America: Alaska, Alberta, Yukon, and North West Territories (Goulet 1986). The genetic and morphological affinity of *D. incisus* to *D. junci* and *D. yukonensis* suggests that the host plant of *D. incisus* is also a species of *Equisetum* (Goulet 1986). The habitat in Finland is a shallow oxbow lake (meander) of the Oulanka river with plenty of *Equisetum fluviatile*, which is also the host of *D. junci*. This habitat matches perfectly with that given for *D. incisus* in North America by Goulet (1986). Several other *Dolerus* species occur syntopically, including the closely related *D. junci* Stephens (= *D. cothurnatus* auct., see above). The melanic form of *D. incisus* is recorded from Finland (all three are females, see above, Fig. 20A) and Norway (Heimdalsmunnen, alt 1150 m, leg. E. Heibo, CEH). Melanic females of *D. subarcticus* (recorded from Norway and Kamtschatka, see under *D. subarcticus*) can be distinguished by their postocellar furrows, the sawsheath (valvula 3) shape, and its apical setation (Fig. 20B). Melanic males can be separated most reliably by their penis valves (Fig. 20C, 20D). Only the melanic colour form of *D. incisus* has so far been recognized from Fennoscandian countries, whereas in Canada and the USA both the black color form and a form with red-banded abdomen and partly reddish legs are known. We studied paratypes of *D. incisus*: 2♀, 2♂, some of them dissected, CNC.

Dolerus possilensis Cameron, 1882

Notes. *Dolerus possilensis* Cameron, 1882a: 178–179. ♀. Syntypes (assumed). Type locality: Possil Marsh near Glasgow, Scotland. Lectotype ♀ hereby designated, labelled: "B.M. TYPE HYM. 1.573" [printed], "*Dolerus possilensis* Cam.", "Cameron 96–76. [printed] Possil" [handwritten], "B.M. TYPE HYM. [printed] *Dolerus possilensis* (Cameron 1882)", "*Lectotypus* [printed] *Dolerus possilensis* Cameron, 1882 [handwritten in block letters] M.Heidemaa design. [printed]" [red]. Most of the abdomen missing. Ovipositor preparation apparently lost, but probably figured in Cameron (1882a: plate XIX, fig. 8). BMNH.

Probably a parthenogenetic species: no male has ever been recorded. The only known Fennoscandian record is from Sweden: 1♀ [labelled as *Dolerus* sp.] "Resarö Waxholm / 6 1915", leg. R. Malaise, NHRS. New to the Swedish fauna.

Dolerus puncticollis Thomson, 1871

Fig. 21

Notes. *Dolerus puncticollis* Thomson, 1871: 286. ♀, ♂. Syntypes. Published type locality: [Sweden]. Lectotype ♂ hereby designated, labelled (printed on pale paper if not stated otherwise): "Lund" [type locality Sweden, Lund], "Lectotypus [printed] 1♂ *Dolerus puncticollis* Thomson, 1871 [handwritten in block letters] M.Heidemaa design. [printed]" [red]. Paralectotypes (3♀, 2♂, Öland, Lund, Scania; the locality labels of 2♀ are illegible). All in MZLU.

Penis valve of the lectotype as in Fig. 21. The taxonomic status of a melanic colour form closely resembling *D. puncticollis* (recorded from Portugal and Greece) is still under study.

Dolerus subarcticus Hellén, 1956

Fig. 20D

Dolerus subarcticus Hellén, 1956: 99–100. ♀, ♂. Syntypes. Published type locality: 16 localities in Finnish Lapland, Russian Karelia and Kola Peninsula, and one locality in Siberia (Krasnojarsk oblast, Jenisseisk). Lectotype designated below.

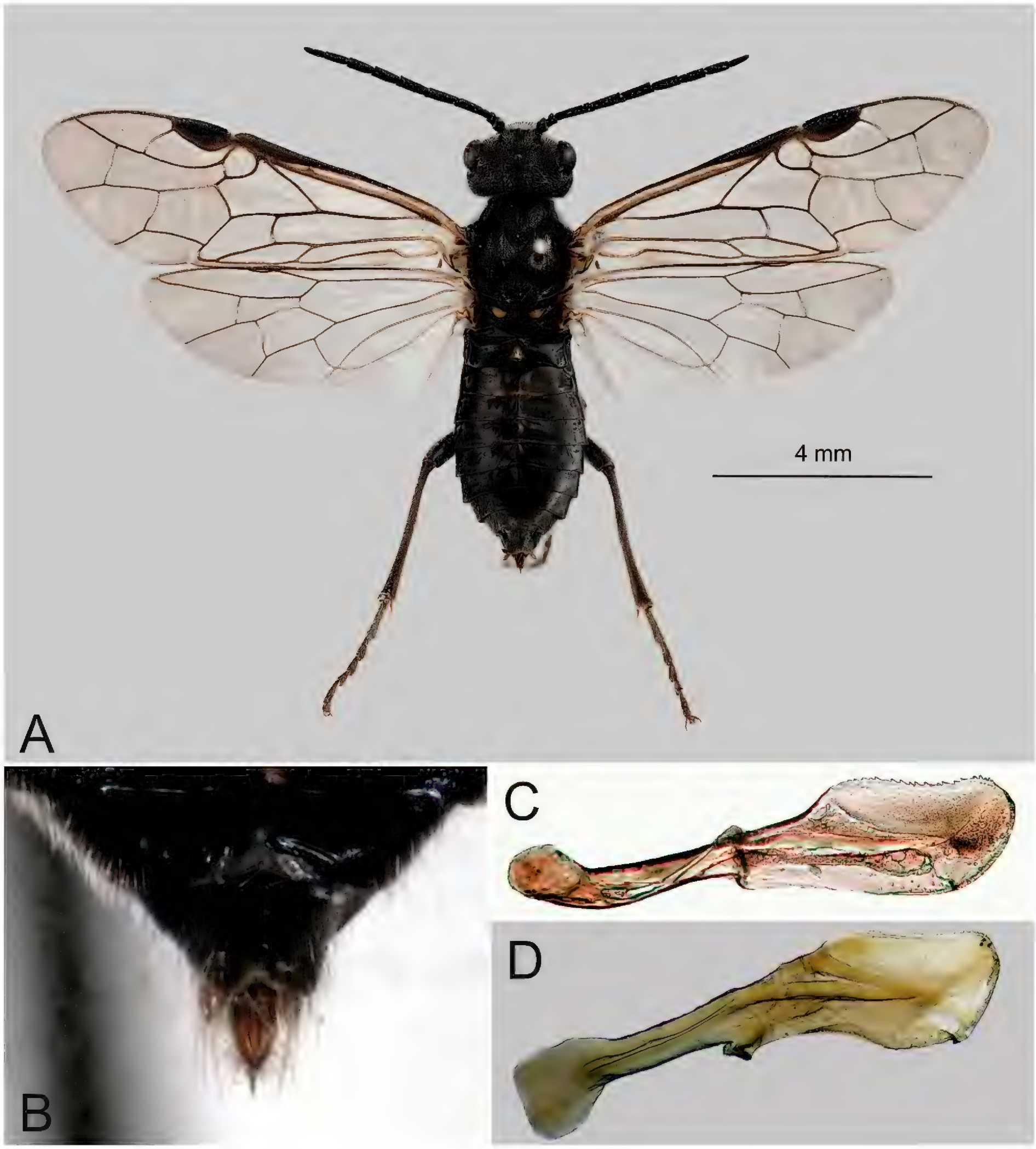

Figure 20. *Dolerus incisus* Goulet, 1986. **A.** Dorsal habitus ♀; **B.** Valvula 3 dorsal; **C.** Penis valve; **D.** *Dolerus subarcticus* Hellén, 1956, penis valve.

Dolerus willoughbyi Benson, 1956: 55–58. ♀, ♂. Holotype. Type locality: Abisko (Sweden).

Type material examined and taxonomic notes. *Dolerus subarcticus* Hellén, 1956. Lectotype ♀ hereby designated, labelled (printed on pale paper if not stated otherwise): "Fennia, Li. Utsjoki, Outakoski, 29.6.1947 [type locality], leg. Hellén" [printed], "Lectotypus 2014, *Dolerus subarcticus*, ♀ Hellén, 1956, M.Heidemaa design." [red], "*Dolerus subarcticus* Hellén, 1956, M.Heidemaa det." [white]. In good condition. 10♀, 8♂ paralectotypes also examined: Ivalo, Kantalaks, Kilpisjärvi, Lutto, Muonio, Paanajärvi, Petsamo, Umba, Utsjoki (Outakoski). All in MZH.

Dolerus willoughbyi Benson, 1956. 2♀, 2♂ paratypes studied. BMNH.

The melanic (black) form (♂) and a nearly black form, with obscure reddish patches on abdominal terga 2–4 (♀), are known from Norway (near Hovet and near Geitryggtunnelen, leg. E. Heibo, CEH), and the melanic form also from Kamtschatka, Russia (a syntype female of *D. pratensis* var. *totus* determined by R. Malaise, in NHRS, see also under *D. yukonensis*).

Figure 21. *Dolerus puncticollis* Thomson, 1871. Penis valve, lectotype.

Dolerus vulneratus Mocsáry, 1878

Notes. *Dolerus vulneratus* Mocsáry, 1878: 199. ♀. Syntypes (assumed). Type locality: Siberia. Lectotype ♀ hereby designated, labelled: "Siber[ia]", "*Dolerus vulneratus* ♀ Mocs.", "Holotypus [printed with red] ♀ *Dolerus vulneratus* Mocsáry, 1878 Zombori, 1977 [handwritten]", "*Lectotypus* [printed] ♀ *Dolerus vulneratus* Mocsáry, 1878 M.Heidemaa des. '22" [handwritten, red]. "*Dolerus vulneratus* Mocsáry, 1878 M.Heidemaa det." [printed]. HNHM.

The "holotype" label attached by Zombori has no nomenclatural significance, because this interpretation was never published. Moreover, the number of specimens was not given in the original description and the ♀ symbol does not necessarily indicate that Mocsáry had only one specimen, even if only one specimen was found in the author's collection. Such assumptions about the status of specimens as holotypes should be avoided according to the Code (ICZN 1999: Articles 72.4.7, 73F). The larva is known through rearing and observations by Ponomarev (2022). Host plant: unidentified Poaceae spec.

Dolerus yukonensis Norton, 1872

Dolerus similis var. *yukonensis* Norton, 1872: 82. ♀, ♂. Syntypes. Lectotype ♀ designated by Ross (1931) [not examined]. Type locality: Alaska, USA.

Dolerus scoticus Cameron, 1881a: 206. ♀. Syntypes (assumed). Lectotype ♀ designated by Benson (1934a). Type locality: Braemar in Aberdeenshire, Scotland.

Dolerus pratensis var. *totus* Malaise, 1931b: 15–16. ♀, ♂. Syntypes. Type locality: Kamtschatka ("Klutchi, Petropawlowsk, Elisowo"). Lectotype designated below.

Type material examined and taxonomic notes. *Dolerus scoticus* Cameron, 1881. Lectotype ♀. BMNH.

Dolerus pratensis var. *totus* Malaise, 1931. Lectotype ♀ hereby designated, labelled: "KAMTSCHATKA Malaise" [printed], "586" [pink, printed], "Typus" [red, printed], "*D. pratensis* var *totus* n. sp. Type [handwritten] Malaise det. [printed]", "*Dolerus scoticus* ♀ Cam [handwritten] A.Zhelochovtsev det 19[printed] 33 [handwritten]", "*Dolerus germanicus totus* Mal." [printed and folded], "*Lectotypus* [printed] *Dolerus pratensis* var. *totus* Malaise, 1931 M.Heidemaa des. [handwritten in block letters]" [red label], "*Dolerus* 2009 [printed] *yukonensis* [handwritten] M.Heidemaa det. [printed]". NHRS. Paralectotypes: 1♀, "280" [printed], "*Dolerus* 20 [printed] 11 *subarcticus* [handwritten] M.Heidemaa det. [printed]" (a melanic female). NHRS. 1♀, "*Dolerus* v. *toto* [sic!] n. var. Paratypus ♀ Malaise det. [written by R. Forsius?]", "*Dolerus yukonensis* Norton M.Heidemaa det.", MZAT (coll. Forsius).

Dolerus yukonensis has a Holarctic distribution, and both red-banded/-marked as well as melanic color forms occur. According to Goulet (1986) the color forms developed independently in the coastal areas of both continents. This speaks against the subspecific status of the melanic color forms suggested by Benson (1959). According to Benson (1934a) *D. scoticus* Cameron can be distinguished from melanic forms of *D. yukonensis* by the strongly developed temporal furrows, like in *D. junci* and *D. incisus*, which are absent in *D. yukonensis*. He also wrote that "*Dolerus totus* Malaise, 1931, from Kamtchatka may be the same species as *D. scoticus* Cam." Benson (1934b) synonymized them (and *D. arcticola* Kiaer, 1898) with *D. scoticus* and later all of them with *D. yukonensis* (Benson 1958: corrigenda). Latterly, he regarded *D. scoticus* as a subspecies of *D. yukonensis* (Benson 1959) and reported it from Switzerland (Benson 1961) and southern Norway, Hallingskarvet District (Benson 1966). However, Benson was not aware of the presence of melanic forms of *D. incisus* and *D. subarcticus* in Norway, the males of which can most reliably be identified by their penis valves (Fig. 20C, D). The sculpture of the abdominal terga in *D. yukonensis*, as in *D. subarcticus*, is not as stable as is often assumed. The depth of the clypeus emargination and the lateral postocellar furrows also vary. However, no potential male of *D. scoticus*, which could support its status as a distinct species as proposed by Haris (2000), has so far been recognized. The lectotype female of *D. scoticus* probably belongs to *D. yukonensis*, and certainly not to *D. junci* or *D. incisus*. Here we retain the synonymy of *D. scoticus* with *D. yukonensis* proposed by Benson (1958) and concurred with by Goulet (1986), but admit that more DNA sequence data are needed to test the taxonomic status of the melanic forms, which show at least some coinciding structural differences. We have studied melanic and red-marked color forms from the Palaearctic, but only red-marked forms from the Nearctic.

Use of the names *Dolerus stygius* Förster, 1860 and *D. megapterus* Cameron, 1881

Lacourt (2020) used *Dolerus megapterus* Cameron, 1881 (Cameron 1881b) as a valid name, rather than its senior subjective synonym *D. stygius* Förster, 1860. On page 197 he wrote "*megapterus* Cameron, 1881 (=*stygius* Förster, 1860 *Nomen oblitum*)". However, according

to the Code (ICZN 1999), this is wrong. *Dolerus stygius* was used by Blank and Taeger (1992) as the name of a valid species, which precludes the application of article 23.9. Lacourt himself also used *D. stygius* as the valid name of this species (Lacourt 1999).

The taxonomy of some species of the *Empria immersa* group (Tenthredinidae, Allantinae)

***Empria improba* (Cresson, 1880)**

Fig. 22A–E

Emphytus improbus Cresson, 1880: 11. ♀, ♂. Syntypes. Type locality: Nevada, USA. Lectotype ♂ (type No. 365) designated by Smith (1979). ANSP.

Tenthredo (Poecilostoma) hybrida Erichson in: Ménétriés in: Middendorff, 1851: 60–61. ♀. Syntypes (assumed). Primary homonym of *Tenthredo (Tenthredo) hybrida* Eversmann, 1847. Type locality: Udskoj Ostrog [Russia, Khabarovsk Krai, Udskoe]. Lectotype ♀ designated by Prous et al. (2011). ZIN. syn. nov.

Poecilosoma plana Jakowlew, 1891: 31. ♀. Type locality: Irkutsk, Russia. ♀. Holotype. ZIN. syn. nov.

Empria itelmena Malaise, 1931b: 23. ♀, ♂. Syntypes. Type locality: Kamtschatka, E[lisowo] [Russia, Kamchatka Krai]. Lectotype ♀ designated by Prous et al. (2011). NHRS. syn. nov.

Empria camtschatica Forsius, 1928: 46–47. ♀. Holotype. Type locality: Russia, Kamchatka Krai, Bolsheretsk [Bolscheretsk]. MZH. syn. nov.

Notes. The species boundaries between willow-feeding taxa of the *Empria immersa* group (*E. immersa*, *E. camtschatica*, *E. plana*, and *E. improba*) have proved to be difficult to elucidate (Prous et al. 2014, 2020). In Fennoscandia, two forms can commonly be found at the same time and place (Prous et al. 2014): *E. immersa* with a dark pterostigma and short antenna, and *E. camtschatica* with a pale pterostigma and long antenna. These two forms can also be distinguished by larval morphology (Fig. 22). Based on *ex ovo* rearings by M. Prous (two females from Sweden and Estonia) and *ex larva* rearings by Ponomarev (2022) of *E. immersa*, and *ex ovo* rearings by M. Prous of *E. camtschatica* (using two females from Sweden), the main difference seems to be in head coloration: *E. immersa* with an occipital fleck or stripe (Fig. 22F–M) and *E. camtschatica* with occipital and parietal stripes (Fig. 22A–E). An additional difference may be that glandubae (white conical warts) are more prominent in *E. immersa* than in *E. camtschatica*. Although based on limited specimen sampling, genome scale data (Prous et al. 2020) support *E. immersa* as a distinct species most consistently compared to the other species in the *E. immersa* group. In Fennoscandia, taxonomy is complicated by the presence of occasional specimens identifiable as *E. plana*, somewhat intermediate in morphology between *E. immersa* and *E. camtschatica* (pterostigma like *E. camtschatica*, saw intermediate). Genome scale data of one *E. plana* female from Sweden do not indicate affinity with *E. immersa*, but do show at least some affinity with *E. camtschatica* (Sweden), *E. improba* (Canada), and one other *E. plana* (Hokkaido, Japan) (see fig. 5 in Prous et al. 2020). Given the above, we synonymize *E. plana* and *E. camtschatica* with *E. improba*, because clear boundaries between these taxa cannot at present be drawn. Thus, in Europe, the specimens with dark pterostigma, short antennae and more prominent serrulae of the saw can be identified as *E. immersa*, and those with pale pterostigma, usually longer antennae, and less prominent serrulae as *E. improba* (see Prous et al. 2014). In North America, however, at least some *E. improba* specimens look externally more like *E. immersa* (dark pterostigma and metafemur), while the serrulae of the saw resemble *E. camtschatica*. Lacourt (2020) suggested that *E. camtschatica* could be a synonym of *E. improba*, but genetically these taxa are not necessarily closer to each other than they are to *E. plana* (Prous et al. 2020). If the circumscription of *E. improba* as proposed here is considered incorrect, then it remains unclear how many additional species should be recognized, and how these should be delimited. For example, in Europe the morphological distinction between *E. camtschatica* and *E. plana* is not clear, although these forms can be more reliably distinguished from *E. immersa*.

Synonymy of *Eutomostethus nigrans* Konow, 1887 with *Eutomostethus ephippium* (Panzer, 1797) (Tenthredinidae, Blennocampinae)

Eutomostethus ephippium (Panzer, 1797) was long regarded (e.g. Enslin 1914; Benson 1952) as a widely distributed species in Europe, whose female occurs in two color forms, without intermediates. One has the mesoscutum, pronotum, tegulae and upper mesepisternum red, whereas the thorax is without red markings in the other. Males are only known from more southern parts of Europe, particularly from the south-east, and have no red markings on the thorax. In recent decades, the two female color forms have been treated as separate species: *E. ephippium* (red-marked) and *E. nigrans* (Konow, 1887) (black). Here, we re-establish the synonymy of these forms.

***Eutomostethus ephippium* (Panzer, 1797)**

Tenthredo ephippium Panzer, 1797: 52:5. ♀. Syntypes. Type locality: Germany [according to title of the publication].

Tomostethus ephippium var. *nigrans* Konow, 1887a: 275. Sex not stated. Syntypes. Type locality not stated.

Eutomostethus nigrans (Konow, 1887): Liston et al. (2006)

Eutomostethus nigrans Blank & Taeger, 1998: 161–162. ♀. Holotype and paratypes. Type locality: Germany, Brandenburg, Luisenfelde, Langer Berg [Grumsiner Forst near Groß Ziethen]. SDEI. Synonymy with *E. nigrans* Konow by Liston et al. (2006).

Notes. COI barcodes of a few specimens identified as *E. nigrans* are indistinguishable from those of a large

Figure 22. Larvae of *Empria* on *Salix*. **A–E.** *E. improba* (Cresson, 1880); **F–M.** *E. immersa* (Klug, 1818).

number of *E. ephippium* (red-marked females). Vikberg et al. (2011) discussed the distribution of the two forms in Fennoscandia and more widely in Europe, noting that the patterns of occurrence are complex, and that they are regionally often sympatric, but that the dark form becomes more common towards the West, suggesting that climatic causes may play a role in maintaining this polymorphism. No other differences have been detected between the red-marked and black forms. We therefore revert to treating them as conspecific colour forms.

Synonymy of *Gilpinia catocala* (Snellen van Vollenhoven, 1858) with *Gilpinia pallida* (Klug, 1812) (Diprionidae)

Gilpinia catocala, or its junior synonym *G. verticalis*, has been treated as a valid species in several works on sawflies, e.g. Hedqvist (1972), Thomas (1987), Taeger et al. (2010). On the other hand, it is difficult to separate from the morphologically very similar *G. pallida*. Pschorn-Walcher (1982) and Viitasaari and Varama

(1987) discussed the status of both forms. Although they concluded that they are probably conspecific, they did not formally synonymize them.

Gilpinia pallida (Klug, 1812)

Lophyrus pallidus Klug, 1812: 54–55. ♀, ♂. Syntypes. Type locality: Sweden and northern Germany. ZMHB.

Lophyrus catocalus Snellen van Vollenhoven, 1858: 276–277. ♀, ♂. Syntypes. Lectotype ♀ designated by Thomas (1987). Type locality: Netherlands, Groesbeek near Nijmegen. syn. nov.

Gilpinia catocala: Thomas (1987) recombination.

Gilpinia verticalis Gussakovskij, 1947: 154–155, 227–228. ♀, ♂. Syntypes. Type locality: localities in Poland, Latvia and Russia. Synonymy with *G. catocala* by Thomas (1987).

Notes. Although we have not studied the lectotype of *Lophyrus catocalus*, the interpretation of its taxonomic status is possible after referring to Gussakovskij's description of *G. verticalis* and the other publications cited above. We agree with Pschorn-Walcher (1982) and Viitasaari and Varama (1987) that the two forms are an expression of individual variability, linked to population differences with a geographical component. Accordingly, we treat *Gilpinia catocala* as a junior synonym of *G. pallida*.

The taxonomy of European *Heptamelus* species (Heptamelidae)

Two European *Heptamelus* species were distinguished by Vikberg and Liston (2009). In recent years, a third species has been found in Finland and Russia.

Heptamelus viitasaarii Liston, Mutanen & Prous, sp. nov.

https://zoobank.org/9AEF81A4-3C92-430D-83E0-8EC11EEFF14E

Description. Female. Figs 23, 24A–C, 26A, B

Colour. Fig. 26A, B. Black. Pale are: palpi, tegula, legs (except for arioli and extreme inner tip of metatibia); in fore wing base and apex of costa, apex of subcostal, base of stigma (Fig. 23A), R1, 1A, 2A+3A [color differences between veins of hind wing not clearly definable]; margins of median excision of abdominal tergum 1, medio-distal part of terga 2–4 (–6) [pale area on tergum 3 is the largest of these], all sterna, more or less the downturned parts of terga 2–8, more or less hypopygium and ovipositor valvifer 2. Wing membranes hyaline.

Head. Pedicel about as long as scape. Head in lateral view with widest point on temple about equal to length of pedicel (Fig. 23E). Malar space slightly shorter than diameter of anterior ocellus. Lowest part of gena densely sculptured, without shining interspaces between the ill-defined pits (Fig. 23E). Clypeus densely pitted, weakly shiny; anterior margin widely emarginate, to about 0.4 of its length (Fig. 23D). Setae on upper head as long, or longer than, diameter of anterior ocellus (Fig. 23E).

Thorax. Whole pronotum except for small antero-ventral area dull, with sculpture (Fig. 23H). Pits on upper mesepisternum large and well-defined (Fig. 23H). Mesoscutellum with large, scattered pits anteriorly and laterally, interspaces shiny; medially and posteriorly nearly without pits and entirely unsculptured (Fig. 23F). Anterior of mesoscutellar appendage densely pitted, with numerous setae, only small posterior area unpitted (Fig. 23F).

Abdomen. Anterior of tergum 1 densely setose. Terga 2 and 3 glabrous. Terga increasingly setose from tergum 4 to apex of abdomen. Weak surface sculpture on tergum 2 becoming stronger on more distal terga. Sawsheath in dorsal view broad, with blunt tip (Fig. 24C). In lateral view exposed length of cercus about 0.5× as long as exposed upper length of valvula 3 (Fig. 23G). Lancet (Fig. 24B, C): 13–14 serrulae; apical serrulae short and high.

***Body length*:** 4.5–8.0 mm

Male. Figs 24D, 26C

Similar to female, except for: red-brown antennal flagellum with basal two antennomeres more or less black; metatibiae completely pale; abdomen completely dark with small, obscure pale markings medially on terga 3–5. Penis valve: Fig. 24D.

***Body length*:** 4.5–5.5 mm

***Variability*:** 5–6 flagellomeres, depending on whether or not the distal one is subdivided; the proportions of this antennomere are thus highly variable. Number of pits on upper mesepisternum variable. The scape and pedicel of females may be more or less pale.

Type material. ***Holotype*** ♀ (ZMUO.044130). Type locality: Finland, Karelia borealis, Kitee Otravaara, YKJ grid coordinates: 6868:3663 [61.8877N 30.1096E]; 04.08.2019 [larva] in *Athyrium filix-femina* (L.), Rearing 380/2019, leg. M. Mutanen. Labels white, printed, except for red holotype label. Deposited in the ZMUO.

Paratypes. Total: 92♀, 6♂. Finland [leg. M. Mutanen and in ZMUO unless otherwise stated]:

Karelia borealis, Kitee: Otravaara [Type locality]; 17♀ (including ZMUO.044126, ZMUO.044127, ZMUO.044128, ZMUO.044129, ZMUO.044131, ZMUO.044132, ZMUO.044133, ZMUO.044134, ZMUO.044135, ZMUO.044136), 04.08.2019 [larvae] in *Athyrium filix-femina* (L.), Rearing 380/2019. 7♀ (including ZMUO.034957, ZMUO.034958, ZMUO.034959), Otravaara, YKJ grid coordinates: 6868:3663 [61.888°N, 30.110°E], 19.06.2018. 30♀ (including ZMUO.058509, ZMUO.058510, ZMUO.058511, ZMUO.058512, ZMUO.058513, ZMUO.058514, ZMUO.058515, ZMUO.058516, ZMUO.058517, ZMUO.058518, ZMUO.058519, ZMUO.058520), Otravaara, YKJ grid coordinates: 6868:3663 [61.888°N, 30.110°E], 24.08.2020, leg. M. Mutanen and M. Prous. Host: *Athyrium filix-femina*, rearing 174/2020. 1♀ (ZMUO.046037), 15.06.2020. ZMUO and SDEI. Otravaara, YKJ grid coordinates: 6868:3664 [61.887°N, 30.129°E]; 8♀ (including ZMUO.034859, ZMUO.034860), 19.06.2018. 1♀ (ZMUO.034995),

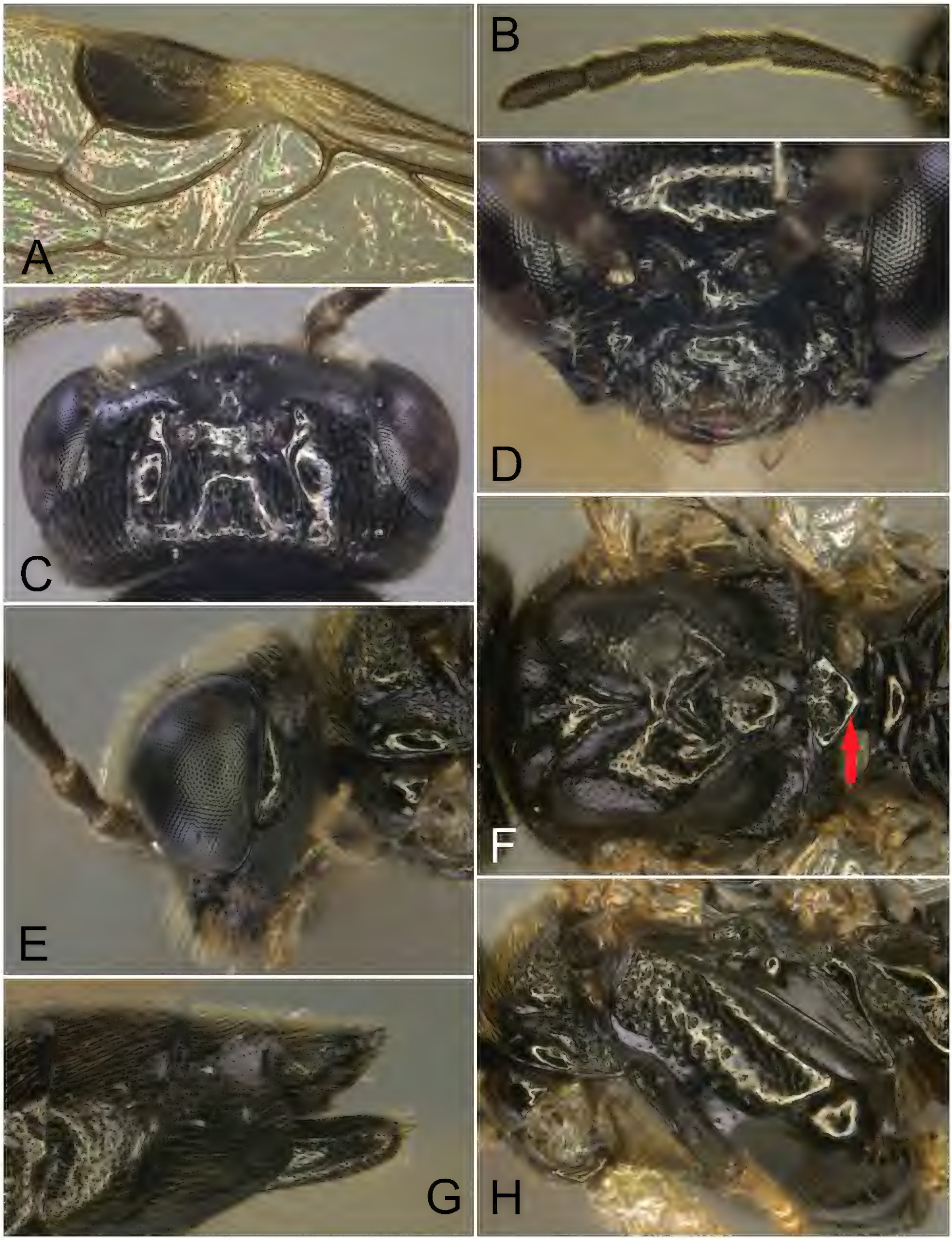

Figure 23. *Heptamelus viitasaarii* sp. nov. ♀ (ZMUO.033969). **A.** Fore wing costa and pterostigma; **B.** Antenna; **C.** Head dorsal; **D.** Lower head frontal; **E.** Head lateral; **F.** Thorax dorsal. Mesoscutellar appendage (arrow); **G.** Abdomen lateral; **H.** Thorax lateral.

18.06.2018. Pajarinmäki, YKJ grid coordinates: 68899:36670 [62.078°N, 30.197°E]; 1♀ (ZMUO.032885), at light, 11.07.2017 [end date of about 5-day period]. 1♀ (ZMUO.033391), at light, 18.07.2017 [end date of about 7-day period]. 2♀ (including ZMUO.034899), 20.06.2018. 1♂ (ZMUO.061917), 14.06.2021, leg. A. Liston, M. Mutanen, M. Prous. 1♂ (ZMUO.061893), 15.06.2021, leg. N. Kiljunen, A. Liston, M. Mutanen, M. Prous. 4♂ 8 ♀♀ (in-

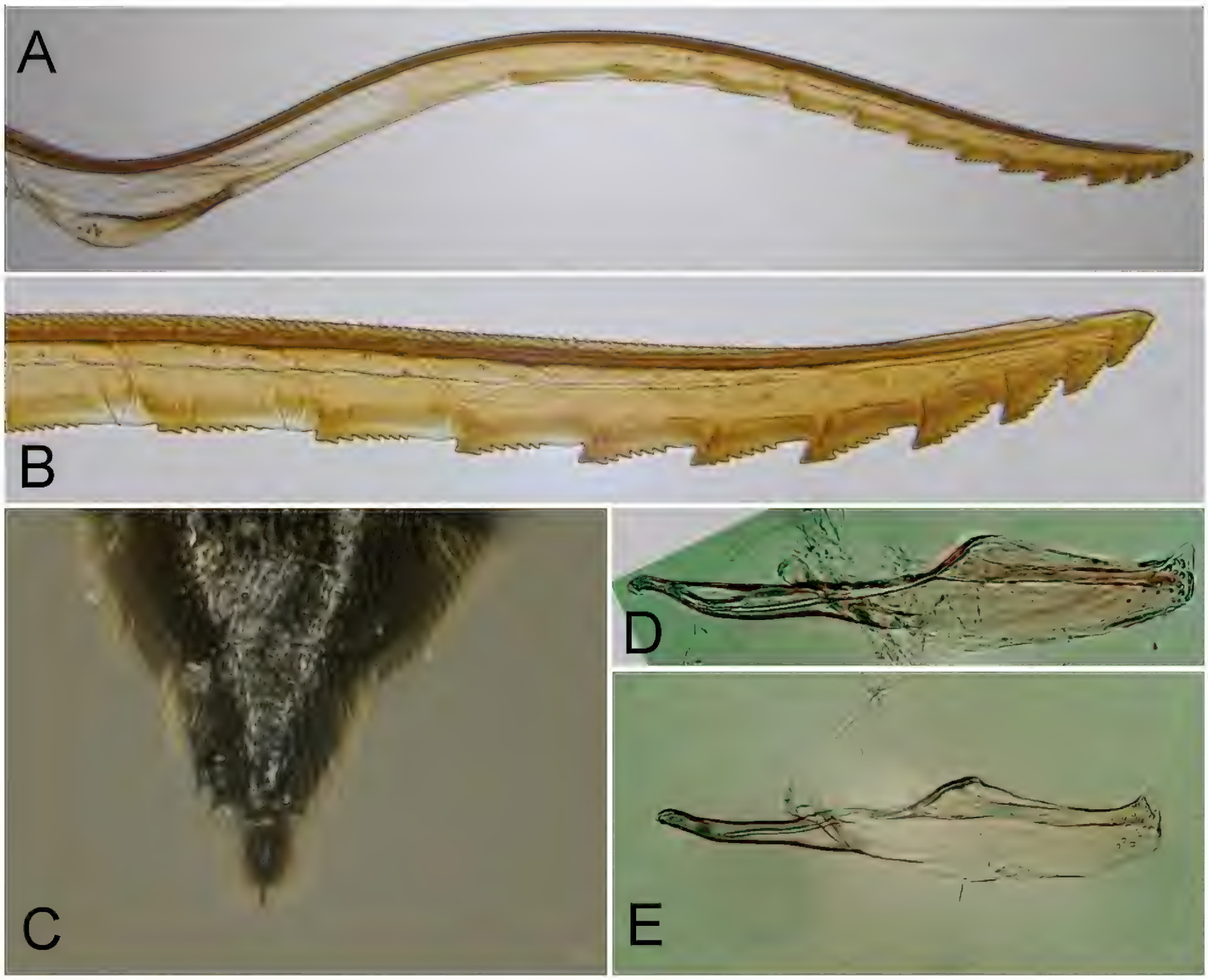

Figure 24. A–D. *Heptamelus viitasaarii* sp. nov. **A.** Lancet (DEI-GISHym31999); **B.** Tip of lancet (DEI-GISHym31999); **C.** Valvula 3 dorsal (ZMUO.033969); **D.** Penis valve (ZMUO.058165); **E.** *Heptamelus dahlbomi* (Thomson, 1870) (DEI-GISHym83629) penis valve.

cluding ZMUO.060946, ZMUO.060947, ZMUO.060948, ZMUO.060949, ZMUO.060950, ZMUO.060951, ZMUO.060952, ZMUO.060953, ZMUO.060954, ZMUO.060955, ZMUO.058165), 18.06.2021, leg. N. Kiljunen, A. Liston, M. Mutanen, M. Prous. 2 larvae from *Matteuccia struthiopteris* (L.) (ZMUO.060557, ZMUO.060558) and 2 larvae from *Athyrium filix-femina* (L.) (ZMUO.060561, ZMUO.060562), 26.07.2021, leg. M. Mutanen, M. Prous. Papinniemi, YKJ grid coordinates: 6883:3656 [62.025°N, 29.990°E]; 6♀ (including ZMUO.034761, ZMUO.034762), 18.06.2018, ZMUO and SDEI. 1♀ (ZMUO.040497), 12.06.2019. Puhos, YKJ grid coordinates: 6889:3653 [62.080°N, 29.938°E]; 2♀ (including ZMUO.034968), 20.06.2018. Hiidensaari, YKJ grid coordinates: 6891:3668 [62.092°N, 30.226°E]; 1♀ (ZMUO.034908), 20.06.2018. Potoskavaara, YKJ grid coordinates: 6893:3670 [62.109°N, 30.266°E]; 1♀ (ZMUO.046430), 28.06.2020, leg. Tupu Vuorinen. Satulavaara, YKJ grid coordinates: 6877:3672 [61.964°N, 30.289°E]; 3♀ (including ZMUO.061792, SDEI-GISHym14061), 14.06.2021, leg. A. Liston, M. Mutanen and M. Prous. ZMUO and SDEI.

Karelia australis: Imatra Kaikkallio, YKJ grid coordinates: 6778:3594 [61.104°N, 28.752°E]; 1♀ (ZMUO.058146), 16.06.2021, leg. A. Liston, M. Mutanen, N. Kiljunen, M. Prous. Joutseno Kuurmanpohja Sunninmäki [61.071°N, 28.731°E]; 1♀ (ZMUO.016815), 06.06.2015, leg. Jussi Vilen, coll. Matti Viitasaari.

Tavastia australis: Kangasala Keisarinharju, YKJ grid coordinates: 6818:3347 [61.444°N, 24.141°E]; 1♀ (ZMUO.061964), 08.06.2021.

Other material. Finland: Nylandia, Vantaa, YKJ grid coordinates: 669:37, 17.06.2021, 1♀, leg. Miikka Friman.

Etymology. Named after Matti Viitasaari, who first recognised a very large female of this species as probably not belonging to *Heptamelus ochroleucus* or *H. dahlbomi*.

Habitat. Damp, shady places in woodland.

Biology. Many female specimens have been reared from larvae in *Athyrium filix-femina* (L.) Roth. (Fig. 25). Larvae found abundantly in 2021 in *Matteucia struthiopteris* (L.) Tod. in Kitee, Finland, were provisionally identified as *H. viitasaarii* by genetic comparison (identical to adults), as later confirmed when females started to emerge in 2022. The larvae feed inside the rachis, eating alternate portions nearly

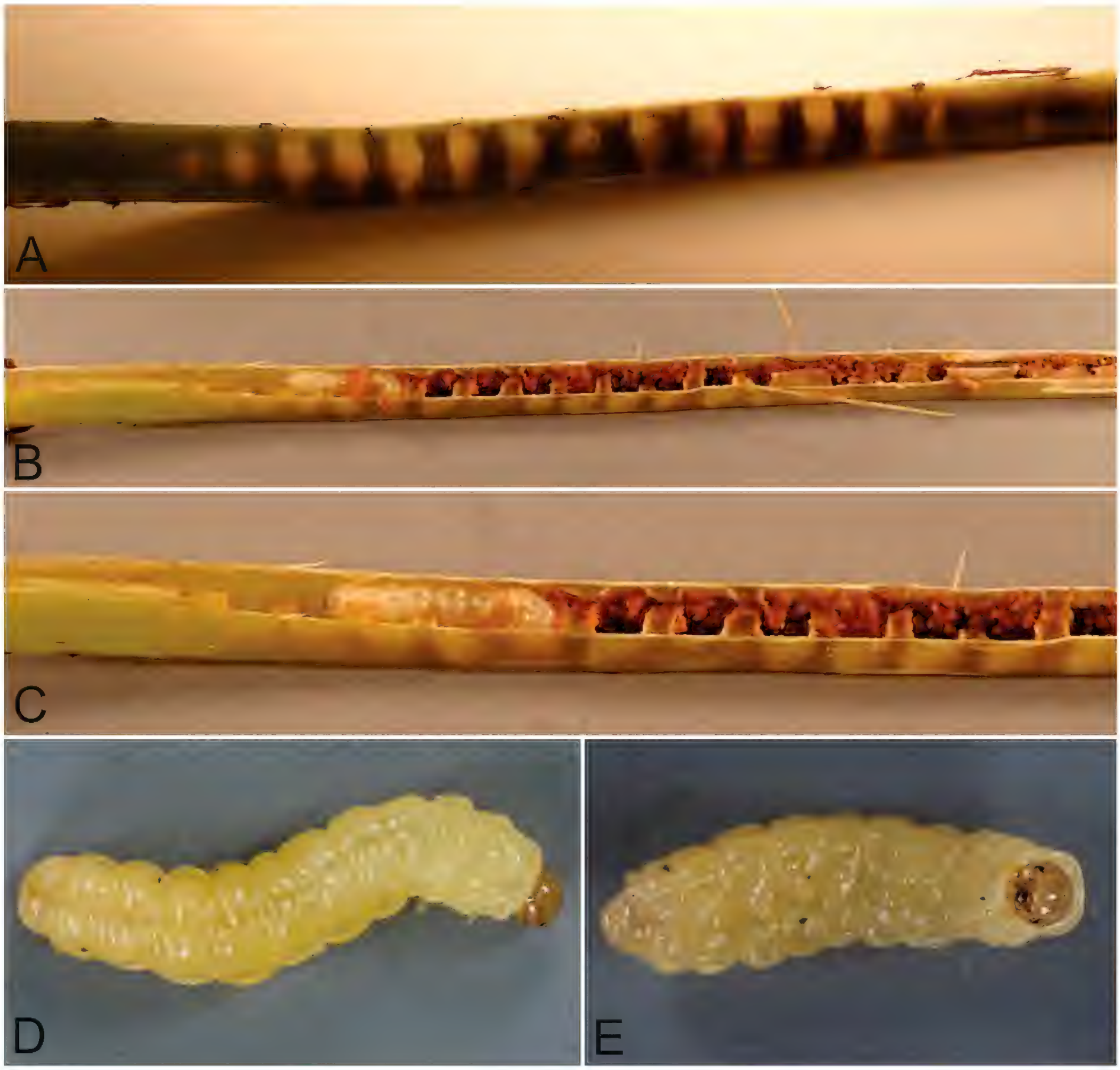

Figure 25. *Heptamelus viitasaarii* sp. nov. Feeding traces and larvae in rachis of *Athyrium filix-femina*. **A.** External appearance of mined rachis; **B, C.** Mine cut open to show "ladder-like" feeding pattern, with larva; **D, E.** Larva.

completely, or only partly (Fig. 25B, C). This results internally in a "ladder-like" appearance, which is externally clearly visible, especially against the light (Fig. 25A). This feeding habit is, however, possibly widespread in *Heptamelus*: at least *H. dahlbomi* larvae feed in the same way. Larvae of *H. viitasaarii* in *M. struthiopteris* regularly overwinter in a chamber made within the fertile fronds at the base of the stem. Strangely, no males have so far been reared, and the few males so far netted are all from a single locality (within an area of less than 1km^2). It was observed that adults reared from plants of different size varied very much in body size, and that the smallest individuals had been feeding on the smallest plant, with correspondingly thin stalks.

Distribution. Finland (North and South Karelia, Tavastia, and Helsinki area), Russia (Moscow). The record from Moscow was published by Vikberg (2017) as *Heptamelus ochroleucus*.

Differential diagnosis. The characters which are most useful for the identification of European *Heptamelus* species are presented below in a key. The extensively pitted and setose mesoscutellar appendage distinguishes *H. viitasaarii* from the two other European species, as well as *H. magnocularis* Malaise, 1931 (Malaise 1931b) from the Russian Far East (see Liston et al. 2018). Note that all body parts of *H. viitasaarii* are conspicuously more densely setose, and pitted, than most other *Heptamelus* species which we have so far examined.

From the females of *Heptamelus dahlbomi*, *H. ochroleucus*, *H. magnocularis*, *H. montanus* Togashi, 1961, and *H. takeuchii* Togashi, 1961 (the latter two from Japan), *H. viitasaarii* differs in its much shorter and higher apical serrulae of the lancet (Fig. 24A, B). *Heptamelus viitasaarii* has a wider sawsheath in dorsal view than either *H. dahlbomi* or *H. ochroleucus*.

Heptamelus japonicus Togashi, 1961, only known in the male sex, differs from *H. viitasaarii* in its entirely pale thorax, abdomen and fore wing pterostigma. The male of *H. takeuchii* differs from *H. viitasaarii* in its more shallowly emarginate and smoother clypeus, and the pale abdominal sternum 9. The male of *H. montanus* resembles that of *H. viitasaarii* in coloration, but as in females of these species, the clypeus of *H. montanus* is much less deeply emarginate (approx. to about 0.2 of its length) and the setae on the upper head shorter (mostly shorter than the diameter of the anterior ocellus).

Key to European Heptamelidae species

1 **a** Claws with large subapical tooth **b** Antenna thin: scape much longer than apical width **c** Head and thorax partly with shiny areas between the setae and pits **d** Cerci of female short, reaching at most to half the length of valvula 3 2
– **aa** Claws simple **bb** Antenna thick: scape about as long as apical width **cc** Head and dorsum of thorax densely and finely microsculptured: completely matt **dd** Cerci of female long, reaching apex of sawsheath or further] ..... *Pseudoheptamelus runari* Conde, 1932 ♀♂ (Fig. 26G, H)

2(1) **a** Female 3
– **aa** Male 5

3(2) **a** Abdominal sterna entirely pale and lateral parts of terga more or less pale **b** Clypeus median emargination about 0.4 as deep as clypeus length 4
– **aa** Abdominal sterna and lateral parts of terga dark [but hypopygium and valvifer 2 more or less pale] **bb** Clypeus median emargination about 0.2 as deep as clypeus length. [Body length: 3.6–5.5 mm] ..... *Heptamelus dahlbomi* (Thomson, 1870) (Fig. 26D)

4(3) **a** Mesoscutellar appendage nearly completely without pits and glabrous; with 0–4 pits and setae on anterior edge **b** Anterior and posterior of fore wing pterostigma dark, with a narrow paler stripe separating these areas and connecting with pale base **c** *Usually* smaller: body length 4.8–5.4 mm ..... *Heptamelus ochroleucus* (Stephens, 1835) (Fig. 26E)
– **aa** At least anterior half of mesoscutellar appendage densely pitted, with numerous setae, and only small posterior area without pits and glabrous **bb** Fore wing pterostigma uniformly dark, except for pale base **cc** Usually larger: body length 4.5–8.0 mm ..... *Heptamelus viitasaarii* sp. nov. (Fig. 26A, B)

5(2) **a** Thorax and abdomen extensively pale-marked ..... *Heptamelus ochroleucus* (Stephens, 1835) (Fig. 26F)
– **aa** Thorax and abdomen nearly completely black 6

6(5) **a** Abdominal sternum 9 largely pale **b** Mesoscutellar appendage nearly completely without pits and glabrous, except on extreme anterior margin.... *Heptamelus dahlbomi* (Thomson, 1870) [males have not been found in Europe; characters are for a male specimen from the Russian Far East: see below]
– **aa** Abdominal sternum 9 entirely dark **bb** At least anterior half of mesoscutellar appendage densely pitted, with numerous setae, and only small posterior area without pits and glabrous ..... *Heptamelus viitasaarii* sp. nov. (Fig. 23F)

Genetics. All European *Heptamelus* species separate clearly based on COI barcodes and nuclear sequences. Unless otherwise stated, COI divergences are given based on full barcode fragments of 658 bp. Maximum COI divergence within both *H. ochroleucus* and *H. dahlbomi* is 0.3%. All *H. viitasaarii* COI sequences are identical, for both sexes, differing by 6.7–7.3% from *H. dahlbomi* and *H. ochroleucus*. COI divergence between *H. dahlbomi* and *H. ochroleucus* is 7.9–8.4%. All nuclear sequences (combined NaK and POL2) of *H. viitasaarii* (n = 4) are identical and differ from *H. dahlbomi* (n = 2) and *H. ochroleucus* (n = 1) by 1.8–2.0%. Nuclear divergence between *H. dahlbomi* and *H. ochroleucus* is 1.9–2.0%.

Remarks. A single specimen (DEI-GISHym83629) of the previously unknown male of *H. dahlbomi* was examined: Russia: Primorskiy Kray, Ussuri Nature Reserve, 150 m., 43.644°N, 132.346°E, 23.05.2016, leg. K. Kramp, M. Prous and A. Taeger (SDEI). Its COI fragment (1376 bp, 537 bp matching the barcoding region) is identical to females from Europe and North America, but differs by 0.2% (overlap 957 bp) from a female from Primorskiy Kray. Color and morphology of the male closely resemble the female (see the detailed description by Vikberg and Liston 2009), but antennomeres 1 and 2 are entirely black (usually more or less pale in the female). Sternum 9 is pale; penis valve (see Fig. 24E).

During the last few years, we have collected about 50 adult *H. viitasaarii* in the field and reared about 90 from Finland. During the same period, we have collected about seven *H. dahlbomi*, one *H. ochroleucus*, and about eight *Pseudoheptamelus runari*. We have collected *H. viitasaarii* mostly in eastern Finland, but in the summer of 2021 also in Tavastia and the Helsinki area, where there has been lots of previous collecting activity. In Finnish collections, including the MZH, there are dozens of specimens of each of *H. ochroleucus*, *H. dahlbomi* and *P. runari*, but we did not find a single specimen of *H. viitasaarii*. The large size of most *H. viitasaarii* female specimens makes them easy to detect. Statistically, it seems highly improbable that not even a single *H. viitasaarii* was collected before 2000, if the species had been present in Finland significantly before then. *Heptamelus viitasaarii* now seems to be present nearly everywhere in Finland where *Athyrium* and other ferns occur, and it flies at a time of year when there has been much

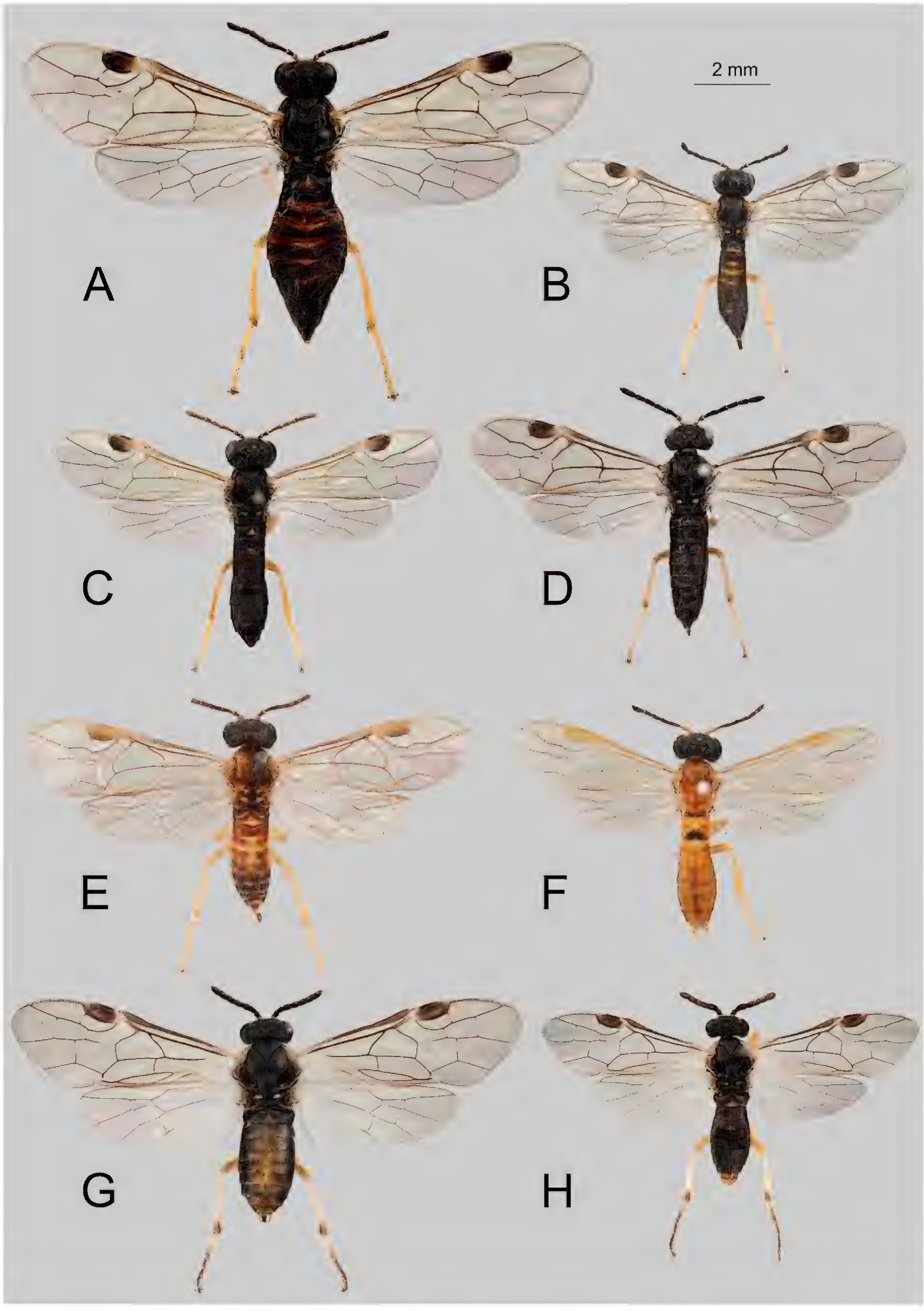

Figure 26. Heptamelidae. **A–C.** *Heptamelus viitasaarii* sp. nov. ♀; **A.** Large ♀ (ZMUO.044130); **B.** Small ♀ (ZMUO.060946); **C.** ♂ (ZMUO.060953); **D.** *Heptamelus dahlbomi* (Thomson, 1870) ♀ (ZMUO.045938). **E, F.** *Heptamelus ochroleucus* (Stephens, 1835); **E.** ♀ (GL.2737); **F.** ♂ (ZMUO.069944). **G, H.** *Pseudoheptamelus runari* Conde, 1932; **G.** ♀ (ZMUO.045903); **H.** ♂ (ZMUO.040197).

collecting activity. Vikberg collected sawflies in eastern Finland for many years, from the early 1960's, as did several other entomologists, but they never found *H. viitasaarii*. It is now so easy to find that we strongly believe that it has only relatively recently spread into Finland from the East. The absence of intraspecific genetic variability in the COI gene may also be indicative of recent expansion to the area, although other reasons for this are possible.

Our interpretation of *Heptamelus montanus* is based on the original description by Togashi (1961), photographs by A. Shinohara of one female and male (Japan, Nagano Prefecture, Mt. Jonen, 16.07.1929, leg. Takeuchi) in the National Science Museum of Japan (Tokyo) from the same series as a male paratype, and a female in the SDEI which closely fits the original description: DEI-GISHym15626, Japan: Nagano, Mt. Iizuna 5 km W, 900 m, 36.724°N, 138.062°E, 24.05.2017, leg. H. Kojima. A. Shinohara (personal communication to Liston) informed us that no type specimens of *H. montanus* can be located, and that they may have been destroyed by mould and collection pests, together with the types of several other species which remained after Togashi's death in the part of his collection kept at his home.

The taxonomy of *Phymatoceropsis* Rohwer, 1910 (Tenthredinidae, Blennocampinae)

In recent years, a species of Blennocampinae previously unknown in Europe has appeared in Finland, occurring locally in large numbers on its host plant *Sambucus racemosa*. It was first found in Finland in the Häme region, by V. Vikberg in 2009, and in every subsequent year. Since then it has been recorded extensively in Finland, south of approximately 62°N (see below). This species has previously been referred to as *Rhadinoceraea sibiricola*, but its generic position requires reconsideration. In morphology, along with *Paracharactus gracilicornis*, it was found to most closely resemble species of *Phymatoceropsis* Rohwer, 1916, with slightly less similarity to species of *Lagonis* Ross, 1937 and *Paracharactus* MacGillivray, 1908.

Phymatoceropsis Rohwer, 1916

Phymatoceropsis Rohwer, 1916: 107–109. Type species: *Phymatoceropsis fulvocincta* Rohwer, 1916, by original designation.

Dicrostema Benson, 1952: 97–98, 101. Type species: *Selandria gracilicornis* Zaddach, 1859, by original designation. Smith (1969): synonymy with *Paracharactus*. syn. nov.

Description. Antennal flagellomeres proportionately narrow; flagellomere 1 3.2–4.7× as long as distal width; the basal flagellomeres not widening distally, and setae normal (not long and coarse as in *Phymatocera*). Outer orbit with pronounced groove behind nearly whole length of eye. Postgenal carina developed slightly below eye (clearly in *P. sibiricola*, but very weakly in *P. gracilicornis*). Posterior of mesoscutellum with some conspicuous pits. Epicnemium variably developed, e.g. present in *P. sibiricola*, absent in *P. gracilicornis*. Claws with a small to minute inner tooth. Stub of 2A + 3A (analis) of fore wings straight, curved towards anterior, or furcate at apex; hind wing with enclosed cell M.

Diagnosis. *Phymatoceropsis* can be distinguished from *Rhadinoceraea* by its proportionately narrower flagellomeres (flagellomere 1 3.2–4.7× as long as distal width in *Phymatoceropsis*, 2.6–3.1× as long as distal width in *Rhadinoceraea*); basal flagellomeres not distally widened (widened in *Rhadinoceraea*); outer orbit with pronounced groove behind whole length of eye (in *Rhadinoceraea*, if a groove is present, then this is behind only part of the eye. *Phymatoceropsis* differs from *Lagonis* in its mainly smooth mesepisternum (upper mesepisternum of *Lagonis* with numerous, large, crater-like pits). *Phymatoceropsis* can be separated from *Paracharactus* (based on North American species and the European *P. hyalinus*) by the mesoscutellum having at least a row of deep, well-defined pits on the posterior part (mesoscutellum entirely without pits in *Paracharactus*). Although in all examined specimens of *Phymatoceropsis* the stub of 2A + 3A of the fore wing is apically furcate (as is also usual in *Rhadinoceraea*), and in most specimens of various Nearctic *Paracharactus* and the European *P. hyalinus* (Konow, 1886) (Konow 1886a) the apex of 2A + 3A is straight, in some individuals of Nearctic *Paracharactus* species, as already noted by Smith (1969), it is furcate / curved strongly upwards, e.g. in *P. rudis* (Norton, 1861).

Comments. The phylogeny of the Blennocampinae (Fig. 27) requires additional study, including analysis of genetic data obtained from a larger number of taxa. The large number of genus names currently in use as valid (Taeger et al. 2010 listed over 100), and their often weak morphological characterization, lead us to suspect that significant "oversplitting" may have occurred. However, at present it seems reasonable to retain *Phymatoceropsis* as valid, and to place *P. sibiricola* and *P. gracilicornis* there. The synonymy of *Phymatoceropsis* and *Dicrostema* is based on the close genetic similarity of the type species of *Dicrostema* to *Phymatoceropsis sibiricola*, and because these two species possess the same combination of characters exhibited by other *Phymatoceropsis* species, including its type species. The host plant ranges of lineages of the Phymatocerini may correlate to a certain degree with their phylogeny. As far as is known, *Rhadinoceraea* species are attached to Iridaceae and Liliaceae (Smith 1969), and *Phymatoceropsis* species to Adoxaceae, i.e. *P. gracilicornis* on *Adoxa*, and *P. japonica* and *P. sibiricola* on *Sambucus*. Interestingly, *Sambucus* species are also the hosts of *Lagonis nevadensis*, and *L. opacicollis*, which genetically also group with *Phymatoceropsis*, albeit with weak statistical support (Fig. 27). Unfortunately, the hosts of *Paracharactus* species are not known for certain. Smith (1969) reasoned that North American species might be attached to *Carex*, based on a tentative identification of a larva, whereas Lacourt (1985)

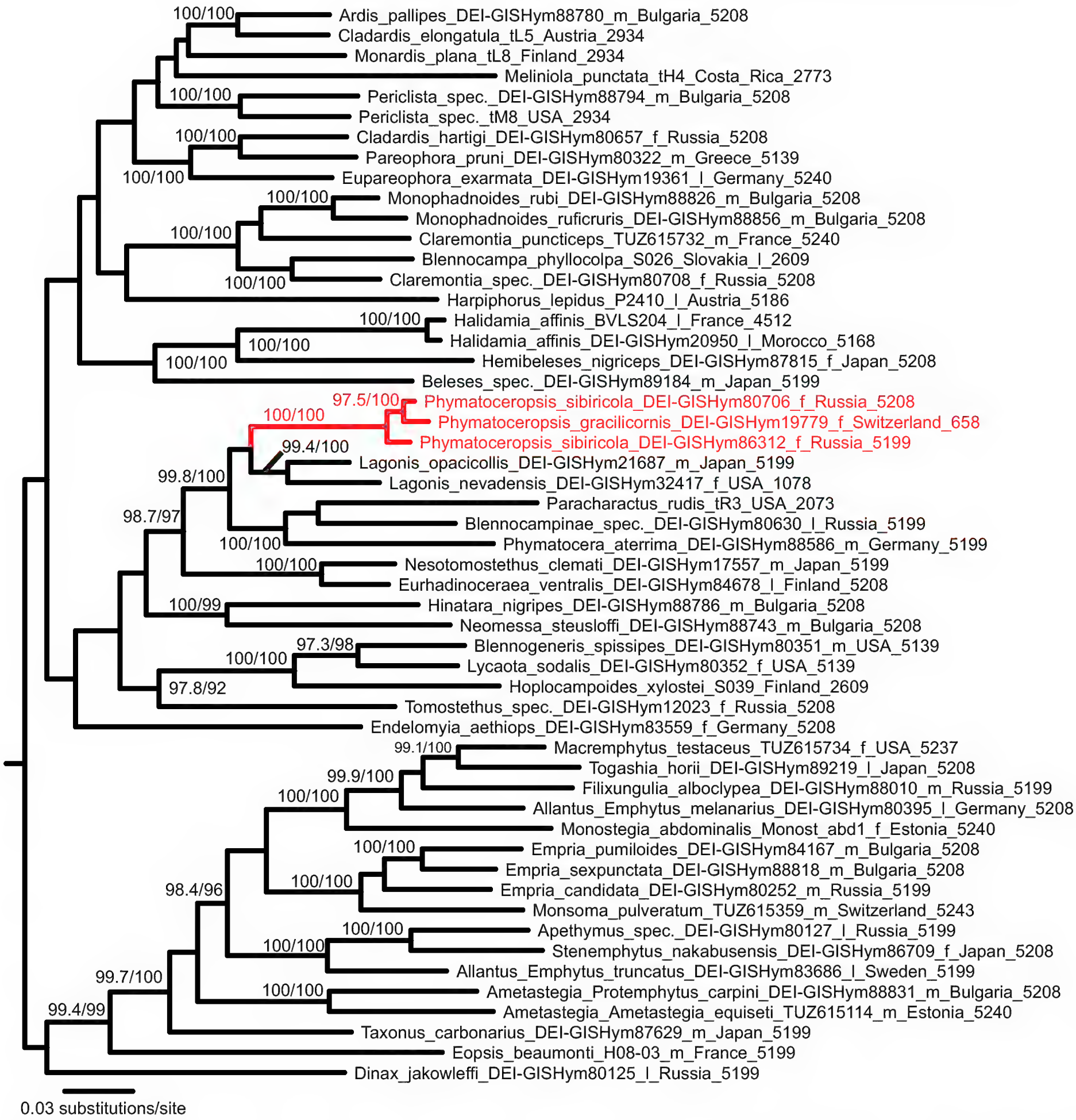

Figure 27. Maximum likelihood tree of Blennocampinae and Allantinae based on mitochondrial COI and two nuclear genes (NaK and POL2). Numbers at branches show SH-aLRT support (%) / ultrafast bootstrap support (%) values. Values of only well supported branches (>90 for both) are shown. Letters "f " stand for "female", "m" for "male", and "l" for larva. Numbers at the end of the tip labels refer to sequence length.

speculated that the West Palaearctic *P. hyalinus* feeds on *Ranunculus aconitifolius* and *R. platanifolius*, without presenting any supporting data or observations. On the other hand, Okutani (1967) recorded the East Palaearctic *Paracharactus leucopodus* Rohwer, 1910 from *Smilax* (Liliales, Smilacaceae), but confirmation of this would be desirable. Both European *Phymatoceropsis* species are univoltine, as are probably nearly all Phymatocerini. Possible exceptions are *Eurhadinoceraea ventralis* (Severin 1997) and *Phymatocera aterrima* (Chevin and Silvestre de Sacy 2001), but the prolonged phenological periods of activity recorded for these species may be the result of polymodal emergence of adults, rather than true plurivoltinism.

***Phymatoceropsis gracilicornis* (Zaddach, 1859) comb. nov.**

Notes. *Selandria gracilicornis* Zaddach, 1859: 34–35. ♀. Holotype. Type locality [see Introduction, p. 7]: proba-

bly Königsberg [= Russia, Kaliningrad]. *Blennocampa gracilicornis*: André (1881). *Monophadnus gracilicornis*: Kirby (1882). *Rhadinoceraea gracilicornis*: Konow (1886a). *Dicrostema gracilicornis*: Benson (1952). *Paracharactus gracilicornis*: Smith (1969).

The host plant of *P. gracilicornis* is *Adoxa moschatellina* L. (Adoxaceae) (Chambers 1947).

Phymatoceropsis sibiricola (Zhelochovtsev, 1939) comb. nov.

Figs 28–29

Notes. *Rhadinoceraea sibiricola* Zhelochovtsev, 1939: 159–160. ♀. Holotype. Type locality: Russia, Krasnoyarsk Krai, Vostotschnoe (35 km SE of Minussinsk).

In the original description, Zhelochovtsev (1939) compared *R. sibiricola* with "*Rh. japonica* Malaise" [*Phymatoceropsis japonica* (Malaise, 1931) (Malaise 1931a)], and stated that they are "closely allied". Comparison of female *P. sibiricola* specimens from Finland (Fig. 28) with a Japanese female of *P. japonica* in the SDEI collection confirmed their similarity. As mentioned by Zhelochovtsev, *P. japonica* has much longer antennae, but the differences described in the structure of the frontal area and mesopleura seemed less clear. The host plant of *P. sibiricola*, as discovered by Vikberg in Finland (see below), is *Sambucus racemosa* (Adoxaceae), since verified several times by Mutanen. The host plant of *P. japonica* is *Sambucus sieboldiana* Blume (Okutani 1956), which is sometimes treated as a synonym or subspecies of *S. racemosa* L.

Summary of records in Finland [not all more recent records are listed].

Uusimaa: Mäntsälä, Saari, 67368:34139 [60.732°N, 25.423°E], 1♀ 18.05.2010, leg. Iiro Kakko (in his collection in Hämeenlinna).

South Häme: Janakkala, Laurinmäki, 67526:3695 [60.862°N, 24.599°E], 1♀ 01.06.2009, 1♀ 26.05.2010, 1♀ 31.05.2010, leg. V.Vikberg (VVT). Janakkala, Hangastenmäki, 67525:3692 [60.861°N, 24.594°E], 1♀ 21.05.2011, 2♀ 22.05.2011, 2♀ 24.05.2011, 1♀ 31.05.2011, 1♀ 16.05.2012, 1♂ 21.05.2013, 1♀ 29.05.2013; in 2014–2021 females were collected every year and a few males altogether, leg. V.Vikberg (VVT). One male and one female collected in 2013 were photographed by Pekka Malinen http://id.luomus.fi/GL.7655 (♂), http://id.luomus.fi/GL.7656 (♀).

North Häme: Jyväskylä. Vikberg identified two females in photographs taken in two different years by Raimo Pelkonen. The last year was 2019, but the first year much earlier.

South Karelia: Imatra, Räikkölä, 61.121°N, 28.790°E, 1♀ 30.05.2021, 1♀ 01.06.2021, leg. M. Mutanen & M. Prous.

Karelia borealis: Kitee, Pajarinmäki, 62.075°N, 30.186°E, 1♀ 22.05.2016, leg. M. Mutanen; 1♀ 06.06.2016, leg. M. Mutanen. Pajarinmäki, 62.078°N, 30.191°E, 1♀ 14.05.2018, leg. M. Mutanen; 1♀ 15.05.2018, leg. M. Mutanen; 1♀ 4♂ 20.06.2018, leg. M. Mutanen; 24♀ 1♂ 17.06.2020, leg. M. and I. Mutanen; 1♀ 18.5.2021, leg. M. Mutanen & M. Prous. Papinniemi, 62.025°N, 29.990°E, 1♀ 16.05.2018, leg. M. Mutanen. Puuteniemi, 62.167°N, 29.970°E, 1♀ 1♂ 15.05.2018, leg. M. Mutanen. Potoskavaara, 62.109°N, 30.266°E, 1♀ 15.05.2018, leg. T. Vuorinen. Puhos, 62.089°N, 29.958°E, 2♀ 18.06.2018, leg. M. Mutanen. Puhos, 62.089°N, 29.939°E, 1♀ 05.06.2019, leg. M. Mutanen. Tyynelä, 62.080°N, 30.321°E, 1♀ 13.05.2019, leg. M. Mutanen. Vanhahovi, 62.169°N, 29.974°E, 2♀ 15.05.2019, leg. M. Mutanen.

Tavastia australis: Hämeenlinna, Hattelmalanharju, 60.971°N, 24.475°E, 1♀ 15.05.2013, leg. M. Raekunnas (ZMUO).

Biology. Oviposition trial by Vikberg (3/2011 VV): three females captured in Hangastenmäki in 2011 were used in this experiment. *Adoxa*, *Sambucus racemosa*, *Lonicera xylosteum* and *Galium* sp. were offered to them. They laid eggs only on *Sambucus racemosa* leaves. The egg is laid through the upperside of the leaf into the tissue of the underside, usually one to two eggs per leaflet, but in one small leaflet eight eggs were counted. Oviposition occurred on 21.05.–24.05. The first larvae were observed on the morning of 28.05. Later, 28 larvae were counted. Five feeding instars were observed and after finishing feeding there was an "extra moult". Prepupae were seen on 07.06–08.06.

1st and 2nd instar larvae are gray, with a brown head. 5th instar larvae are 13–14 mm long; head width ca. 1.6 mm (Fig. 29). Head brownish, behind the eye a black fleck which is curved backwards and upwards. Body dorsally dark gray with greenish hue; ventrally whitish gray. Black suprastigmal flecks on thoracic segment 3 and abdominal segments 1–9.

Synonymy of *Pristiphora trochanterica* (Lindqvist, 1952) with *Pristiphora coactula* (Ruthe, 1859) (Tenthredinidae, Nematinae)

Pristiphora coactula (Ruthe, 1859)

Nematus coactulus Ruthe, 1859: 307–308. ♀. Holotype. Type locality: Iceland.

Lygaeonematus (*Lygaeotus*) *trochantericus* Lindqvist, 1952: 101–102. ♀. Holotype (http://id.luomus.fi/GL.7708) and paratypes (♀, ♂). Type locality: Finland, Utsjoki, Outakoski. syn. nov.

Notes. The nuclear sequence data obtained for this study revealed three main clusters within the *Pristiphora carinata* group: *P. carinata*, *P. coactula*, and *P. borea* + *P. groenblomi* + *P. albilabris* (Fig. 30). No nuclear sequence data are yet available for *P. breadalbanensis* (Cameron, 1882b) and *P. lativentris* (Thomson, 1871). A nearly perfect match morphologically to the *L. trochantericus* holotype is ZMUO.035514, which falls within the *P. coactula* cluster

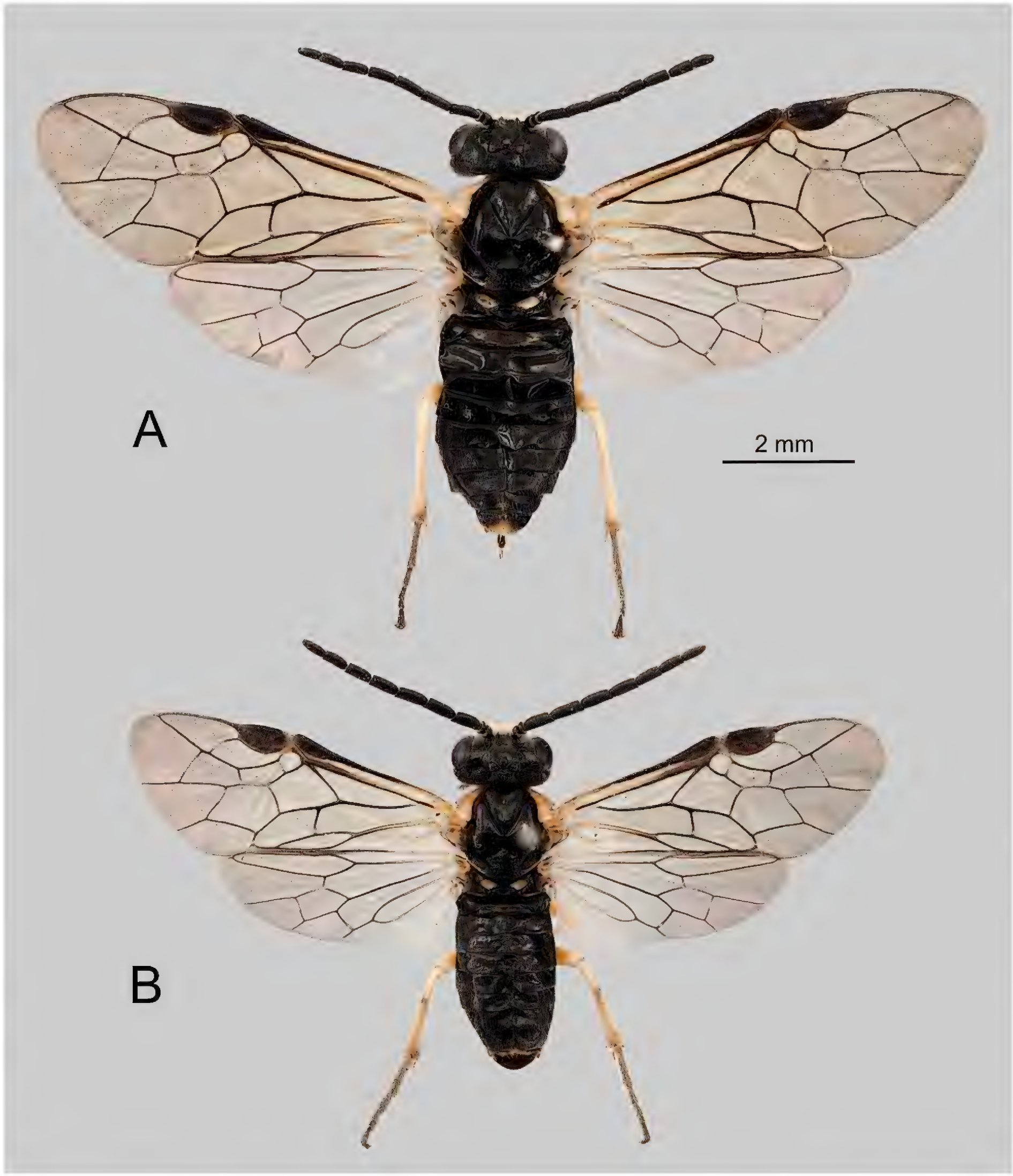

Figure 28. *Phymatoceropsis sibiricola* (Zhelochovtsev, 1939). **A.** ♀ (ZMUO.039464); **B.** ♂ (ZMUO.058201).

based on nuclear DNA (Fig. 30). There are two main clusters based on COI sequences, one of which contains only *P. borea* (Konow, 1904) and *P. groenblomi* (Lindqvist, 1952) and the other one all species (Fig. 31). Within the COI cluster containing all species (Fig. 31), *P. borea*, *P. groenblomi*, and *P. albilabris* (Boheman, 1852) (*Betula* feeders) tend to separate from *P. coactula* (*Salix*) and *P. carinata* (Hartig, 1837) (*Vaccinium*). Based on the specimens having nuclear data, the species (mainly females) of the *carinata* group may be separated by the following key, although it might not always work for all specimens, particularly *P. coactula* and *P. borea*. Excluded from the key are the (sub)arctic species *P. breadalbanensis* and *P. lativentris*. *Pristiphora lativentris* may have somewhat different serrulae from the other species (almost papilliform, see fig. 215 in Prous et al. 2017). The identity of *Pristiphora breadalbanensis* (most similar to *P. borea* and *P. coactula*) needs further research to confirm if characters (e.g. structure of median mesoscutal lobes) mentioned by Benson (1958) to separate this species are reliable.

Figure 29. *Phymatoceropsis sibiricola* (Zhelochovtsev, 1939). **A–C.** Nearly fully-fed larvae on *Sambucus racemosa*.

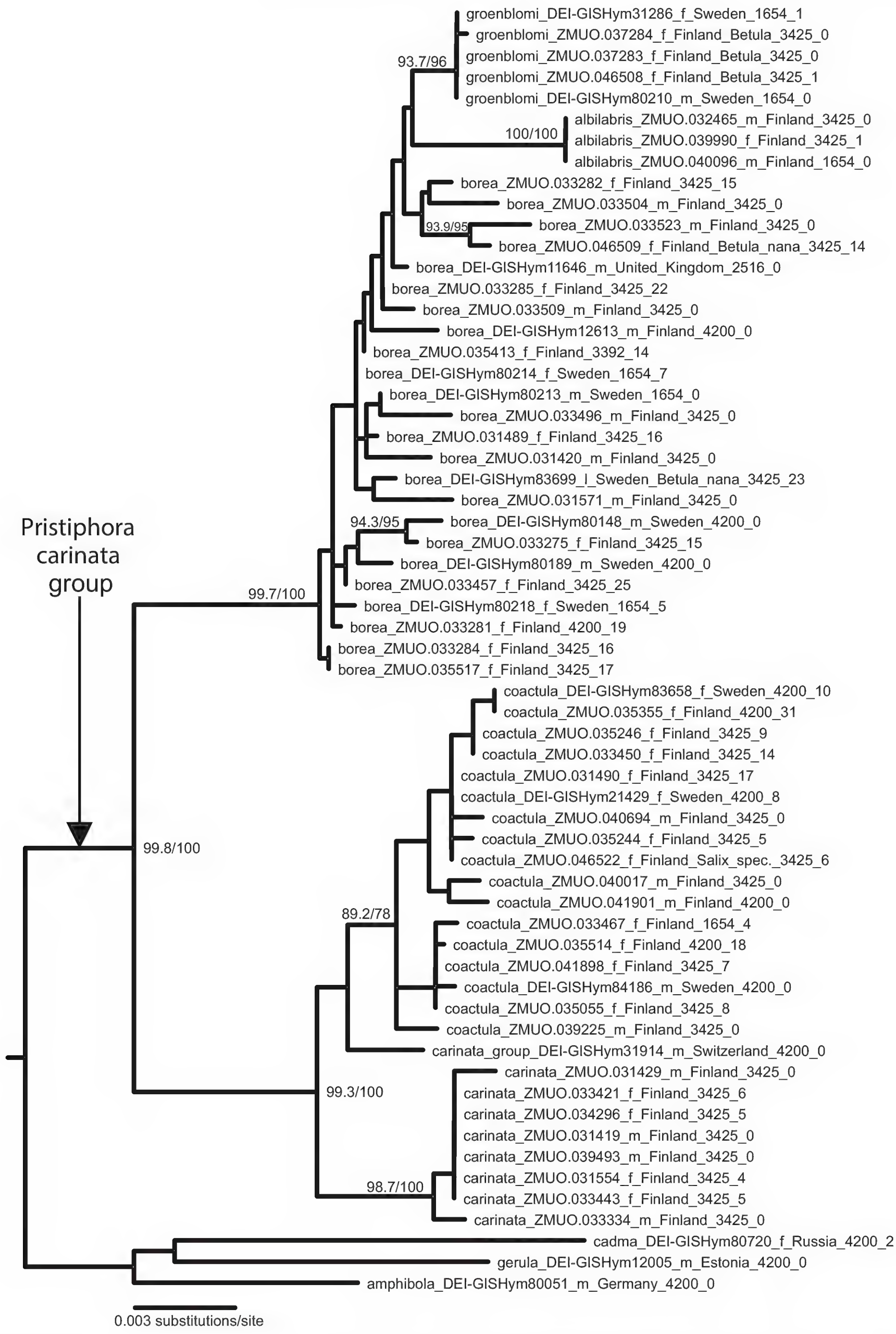

Figure 30. Maximum likelihood tree of *Pristiphora carinata* group based on nuclear genes (NaK and POL2). Numbers at branches show SH-aLRT support (%) / ultrafast bootstrap support (%) values. Values of only well supported branches (>90 for both) and of *P. coactula* clade with moderate support are shown. Letters "f " stand for "female", "m" for "male", and "l" for larva. Numbers at the end of the tip labels refer to sequence length and the number of heterozygous positions.

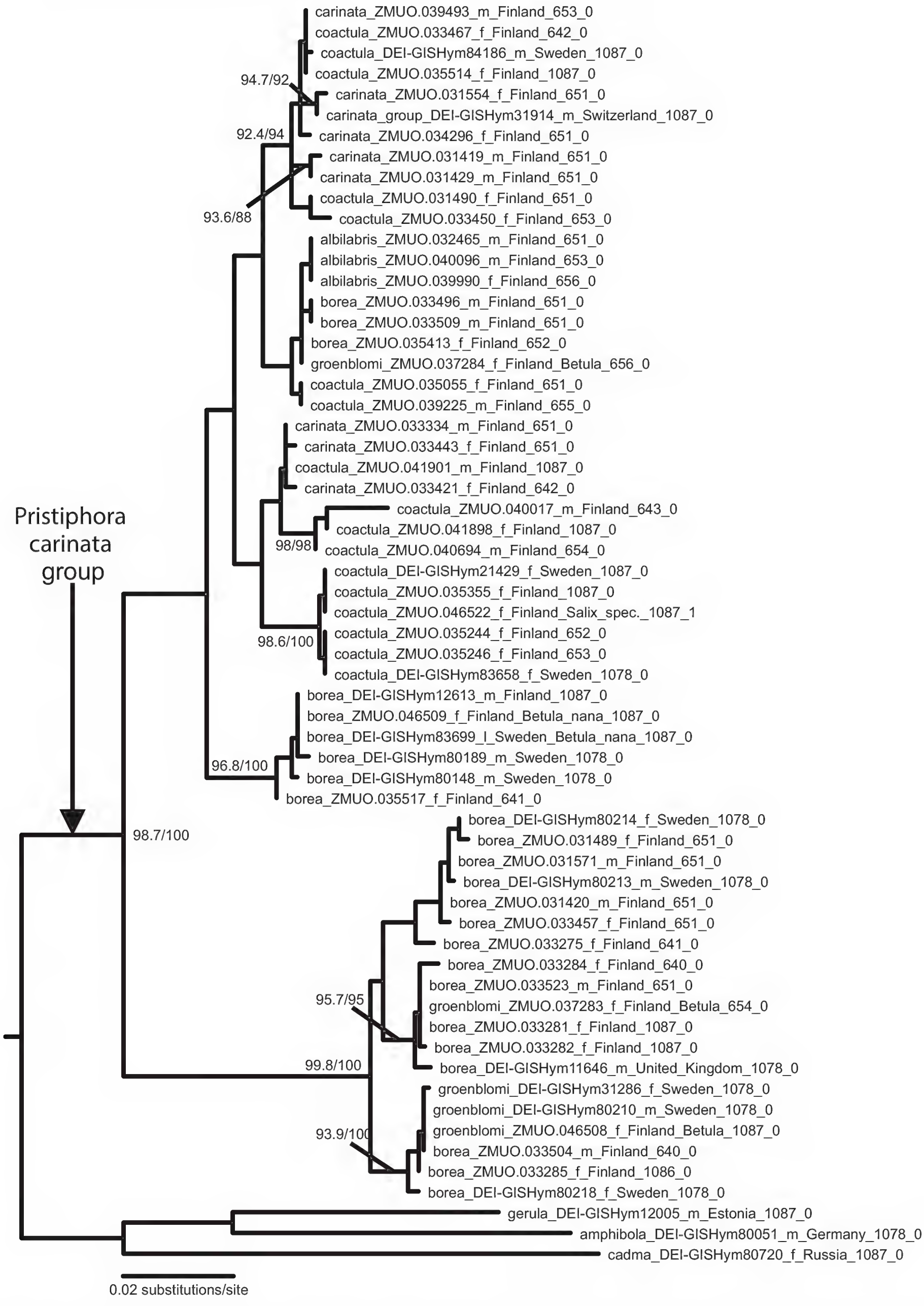

Figure 31. Maximum likelihood tree of *Pristiphora carinata* group based on mitochondrial COI gene. Numbers at branches show SH-aLRT support (%) / ultrafast bootstrap support (%) values. Values of only well supported branches (>90 for both) are shown. Letters "f" stand for "female", "m" for "male", and "l" for larva. Numbers at the end of the tip labels refer to sequence length and the number of ambiguous positions.

1 **a** Pterostigma distinctly darker than costa **b** Legs largely orange or reddish **c** In female, valvifer 2 and terga 9–10 black or slightly pale **d** In male, sternum 9 blac..... *P. albilabris* (Boheman, 1852) ♂♀ and *P. groenblomi* (Lindqvist, 1952) ♂♀ in part

– **aa** Pterostigma similarly pale as costa or somewhat darker than costa **bb** Legs largely black to pale **cc** In female, valvifer 2 and terga 9–10 extensively pale **dd** In male, sternum 9 black to pale..... 2

2(1) **a** Pterostigma somewhat darker than costa **b** Legs largely orange or reddish **c** Metafemur completely pale **d** In female, terga 2–8 and sterna black **e** In male, sternum 9 (always?) black ..... *P. groenblomi* ♂♀ in part

– **aa** Pterostigma similarly pale as costa **bb** Legs largely black to yellowish **cc** Metafemur black to pale **dd** In female, terga 2–8 and sterna black or partly pale (starting from tergum 2 and sternum 2) **ee** In male, sternum 9 black to pale ... ♀ (males of the following species not separated)..... 3

3(2) **a** Valvula 3 in dorsal view gradually narrowing, without invagination and with sharp tip (see figs 98–99 in Prous et al. 2017) **b** Usually only terga 8–10 or 9–10 extensively pale, but sometimes more (starting from tergum 5)..... ..... *P. carinata* (Hartig, 1837)

– **aa** Valvula 3 in dorsal view more or less truncate, with or without indistinct invagination and with broader tip **bb** Usually terga 8–10 or more (starting from tergum 2) at least partly pale..... 4

4(3) **a** Valvula 3 short, truncate and usually with indistinct invagination (Fig. 33C, D) **b** Abdomen *usually* becoming gradually paler from base to apex, dorsally *usually* starting from tergum 7, laterally and ventrally from tergum 2 and sternum 2 **c** Metafemur *usually* completely pale **d** Clypeus *usually* mostly pale ..... *P. coactula* (Ruthe, 1859)

– **aa** Valvula 3 *usually* longer, slightly narrowed at apex and without invagination (Fig. 33A), but sometimes not distinguishable from *P. coactula* (Fig. 33B) **bb** Abdomen *usually* slightly or extensively pale only at apex, dorsally *usually* terga 8–10, laterally *usually* terga 7–10, ventrally *usually* sternum 7 **cc** Metafemur black to completely pale **dd** Clypeus mostly black to mostly pale.....*P. borea* (Konow, 1904)

Examples of lancets of *P. borea*, *P. carinata*, and *P. coactula* are shown in Fig. 32A–C, but more specimens need to be examined to check if there are any consistent differences between the species. Morphological differences between the males of *P. borea*, *P. carinata*, and *P. coactula* are not clear. Externally, it seems that *P. coactula* tends to be paler (clypeus, pronotal angles, tegula, metafemur, and sternum 9 completely or mostly pale) than *P. borea* and *P. carinata*. The dorso-apical margin of the paravalva of *P. borea* (Fig. 34B) may be more strongly inclined basally compared to *P. carinata* and *P. coactula*, but differences between the penis valves of the latter two species are not clear (Fig. 34A, D, E). The most distinctive penis valve in the *P. carinata* group seems to belong to *P. albi-*

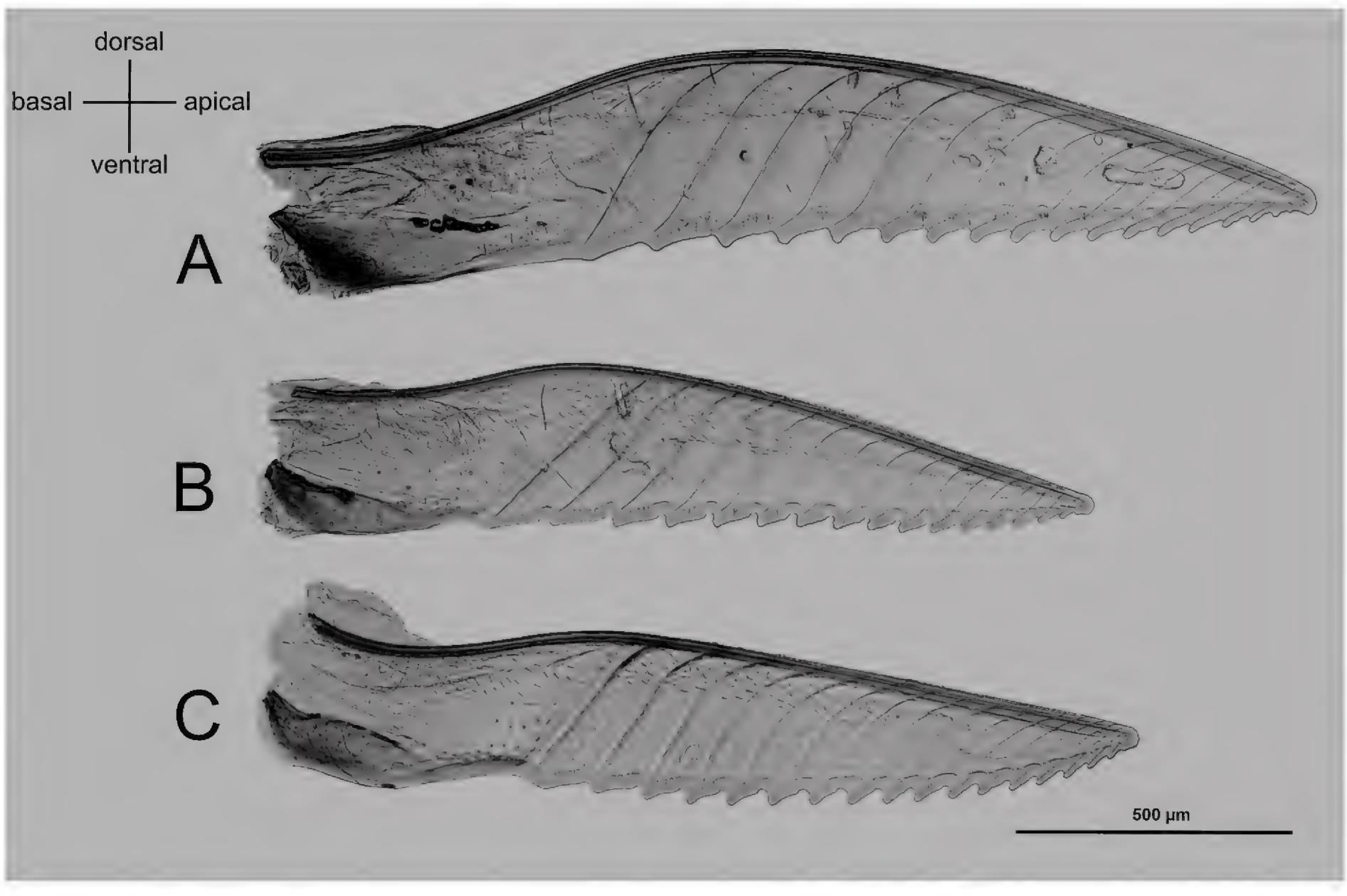

Figure 32. Lancets of *Pristiphora carinata* group. **A.** *P. coactula* (ZMUO.031490); **B.** *P. borea* (ZMUO.033284); **C.** *P. carinata* (ZMUO.031554).

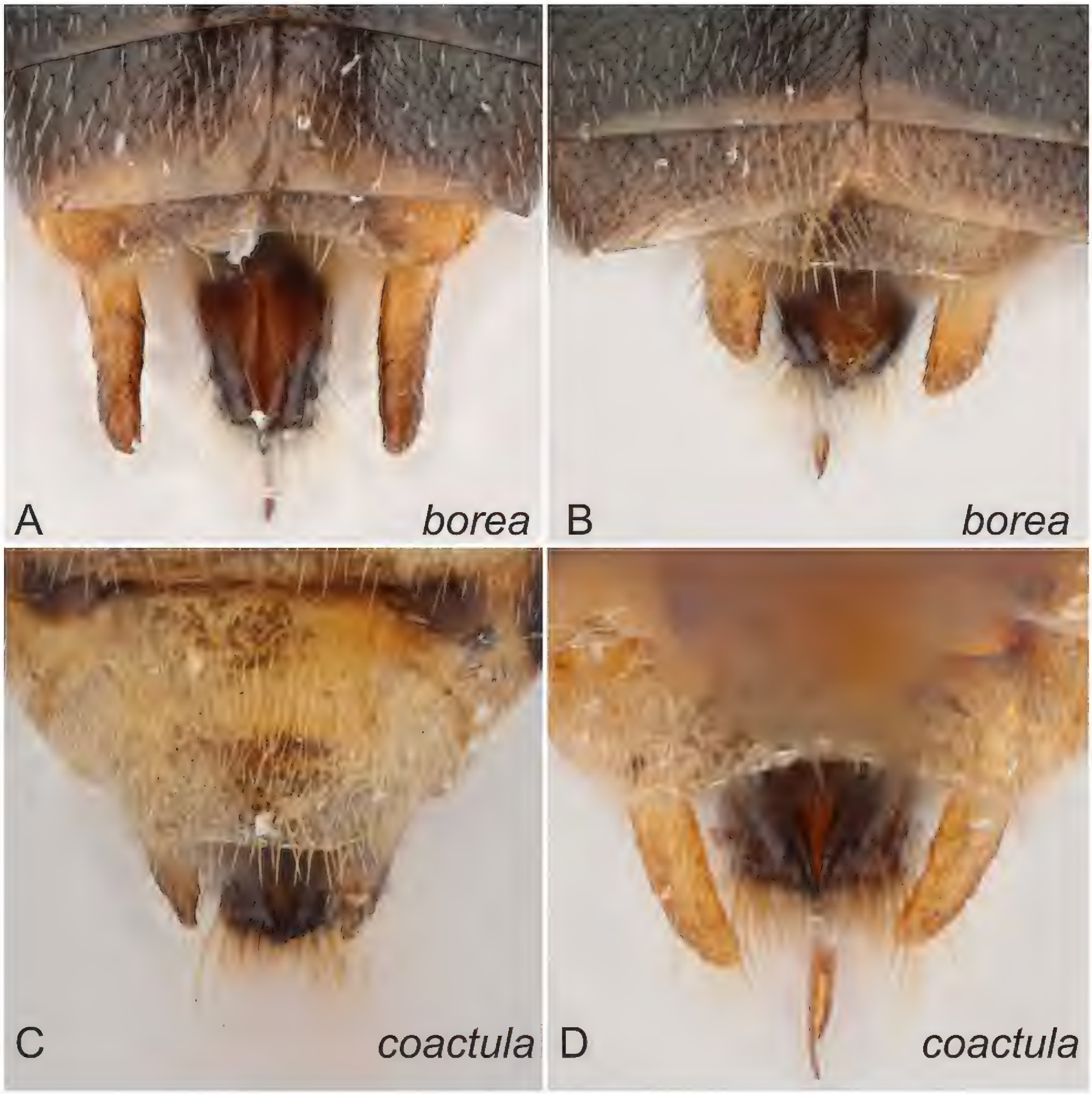

Figure 33. Tip of abdomen of *Pristiphora carinata* group females in dorsal view. **A.** *P. borea* (ZMUO.035517); **B.** *P. borea* (ZMUO.033457); **C.** *P. coactula* (ZMUO.046522); **D.** *P. coactula* (ZMUO.035246).

labris (Fig. 34F), which has the most distinctly inclined dorso-apical margin of paravalva. Overall shape of penis valve of *P. groenblomi* (Fig. 34C) is most similar to *P. borea*, but it may be larger.

Synonymy of *Scolioneura vicina* Konow, 1894 with *Scolioneura betuleti* (Klug, 1816) (Tenthredinidae, Blennocampinae)

Altenhofer and Taeger (1998) split *Scolioneura betuleti* (Klug, 1816) into two species, distinguished only by their different phenology. They applied the name *S. vicina* Konow, 1894 (Konow 1894a) to specimens found early in the season, and *S. betuleti* to those found later. Although the flight periods appear to be separated in central Europe, this is less likely to be the case in the very short summers of northern Lapland and at higher altitudes in the mountains. MacQuarrie et al. (2007) compared mitochondrial cytochrome oxidase I and II genes of putative European *S. betuleti* and *S. vicina*, as well as Canadian populations of *S. betuleti*, and found no significant differences. They concluded that *S. vicina* may not be reproductively isolated from *S. betuleti*. Leppänen et al. (2012) sequenced two mitochondrial and two nuclear genes, and likewise found no significant differences. They considered that the two nominal species are synonymous. We follow their opinion.

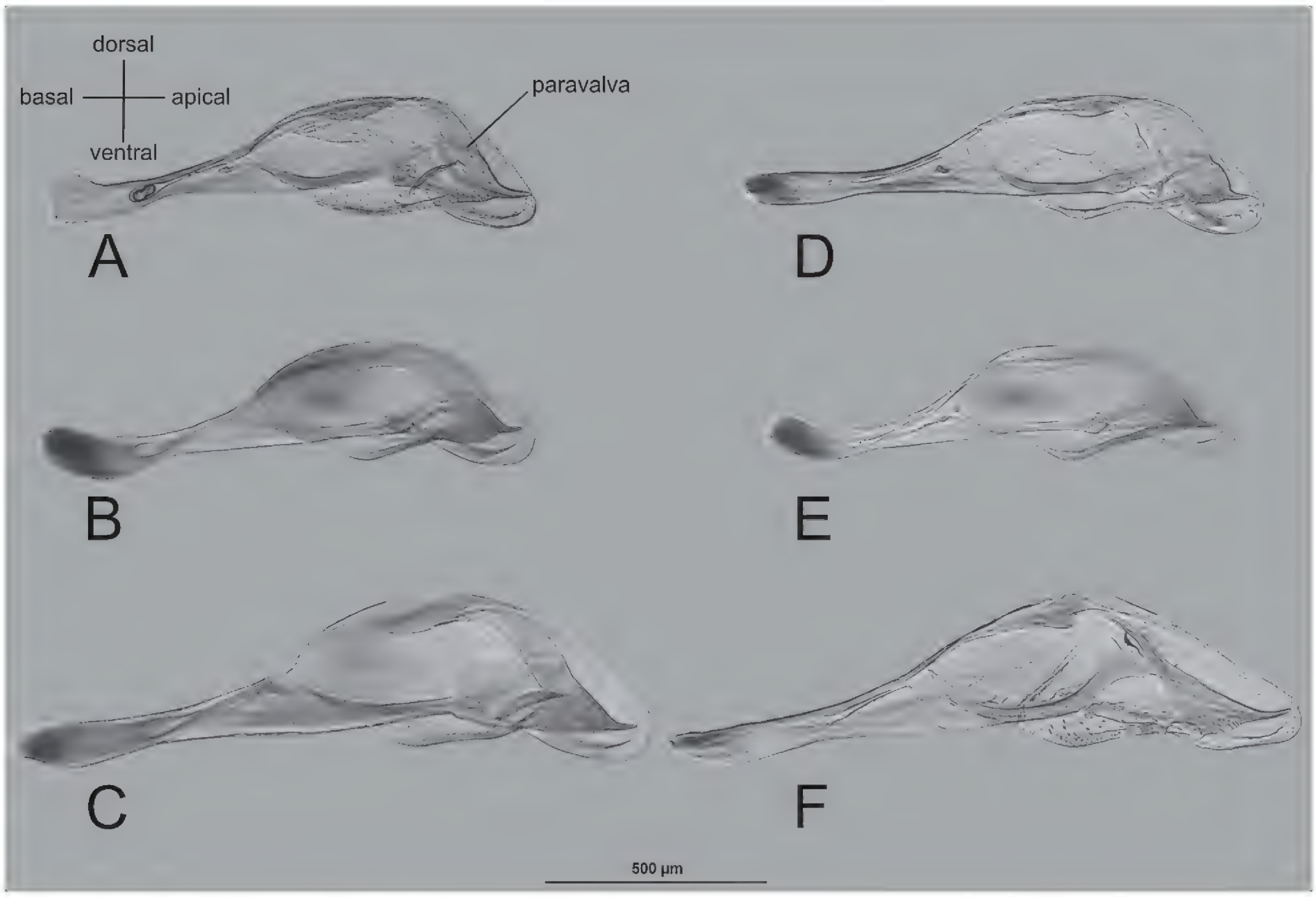

Figure 34. Penis valves of *Pristiphora carinata* group. **A.** *P. carinata* (ZMUO.031419); **B.** *P. borea* (DEI-GISHym80148); **C.** *P. groenblomi* (DEI-GISHym80210); **D.** *P. coactula* (ZMUO.039225); **E.** *P. coactula* (DEI-GISHym84186); **F.** *P. albilabris* (ZMUO.032465).

Synonymy of *Selandria flavistigma* Grönblom, 1939 with *Brachythops wuestneii* (Konow, 1885) confirmed (Tenthredinidae, Selandriinae)

Fig. 35C

In northern Fennoscandia occur specimens of a *Brachythops* species which look unusual (Fig. 35C) compared to specimens from further south. Unlike other European *Brachythops* specimens (e.g. Fig. 35A, B), the fore wing stigma and costa are entirely pale, and in lateral view the middle to apical flagellomeres are conspicuously shorter compared to their width (Fig. 35C). Like in *Brachythops wuestneii* (Konow, 1885), the median mesoscutal lobes are strongly setose and pitted: in *B. flavens* (Klug, 1816) they are weakly pitted and more glabrous. Grönblom (1939) described such specimens under the name *Selandria flavistigma* from six females collected in the Petsamo area (now Russia, Murmansk oblast, Pechenga). We have collected eight female specimens of this appearance from above the tree line near Abisko (Sweden) and Kilpisjärvi (Finland). The morphological differences led us to suspect that the high-northern form represents a third European species. However, although its COI barcode differs somewhat from *B. wuestneii*, no significant differences were found in two nuclear DNA markers (NaK and POL2). Nuclear divergence (3389 bp) between one *B. wuestneii* and one *B. flavistigma* is 0.4%, which is not much more than divergence within *B. flavens* (up to 0.2% based on three specimens). For comparison, nuclear divergence between *B. flavens* and *B. wuestneii* s.l. is 1.6–2.6%. On current evidence, *S. flavistigma* should continue to be treated as a synonym of *B. wuestneii*, as in Taeger et al. (2010). Perhaps it is a parthenogenetic form of *B. wuestneii* found instead of the "normal", sexually reproducing form, in arctic environments in northernmost Lapland. It is interesting that typical specimens of *B. wuestneii* have not been found at all in the Abisko or Kilpisjärvi areas, although typical *B. wuestneii* is distributed at least to Central Lapland in Finland (ca 68°N).

Material examined [specimens with characters of *flavistigma*]:

Finland: 3♀ (including DEI-GISHym84590), Kilpisjärvi, Jehkas, 550–950 m, 69.086°N, 20.800°E, 28.06.2020, leg. M. Mutanen, M. Prous and A. Liston (SDEI)

Sweden: 3♀ (including DEI-GISHym19672, 19673), Torne Lappmark, Abisko, Mt Njulla above treeline, ca. 900 m, 68.362°N, 18.730°E, 05.07.2012, leg. A. Liston and A. Taeger (SDEI). 2♀ (including DEI-GISHym80092), data as preceding, but 30.06.2016, leg. A. Liston and M. Prous (SDEI).

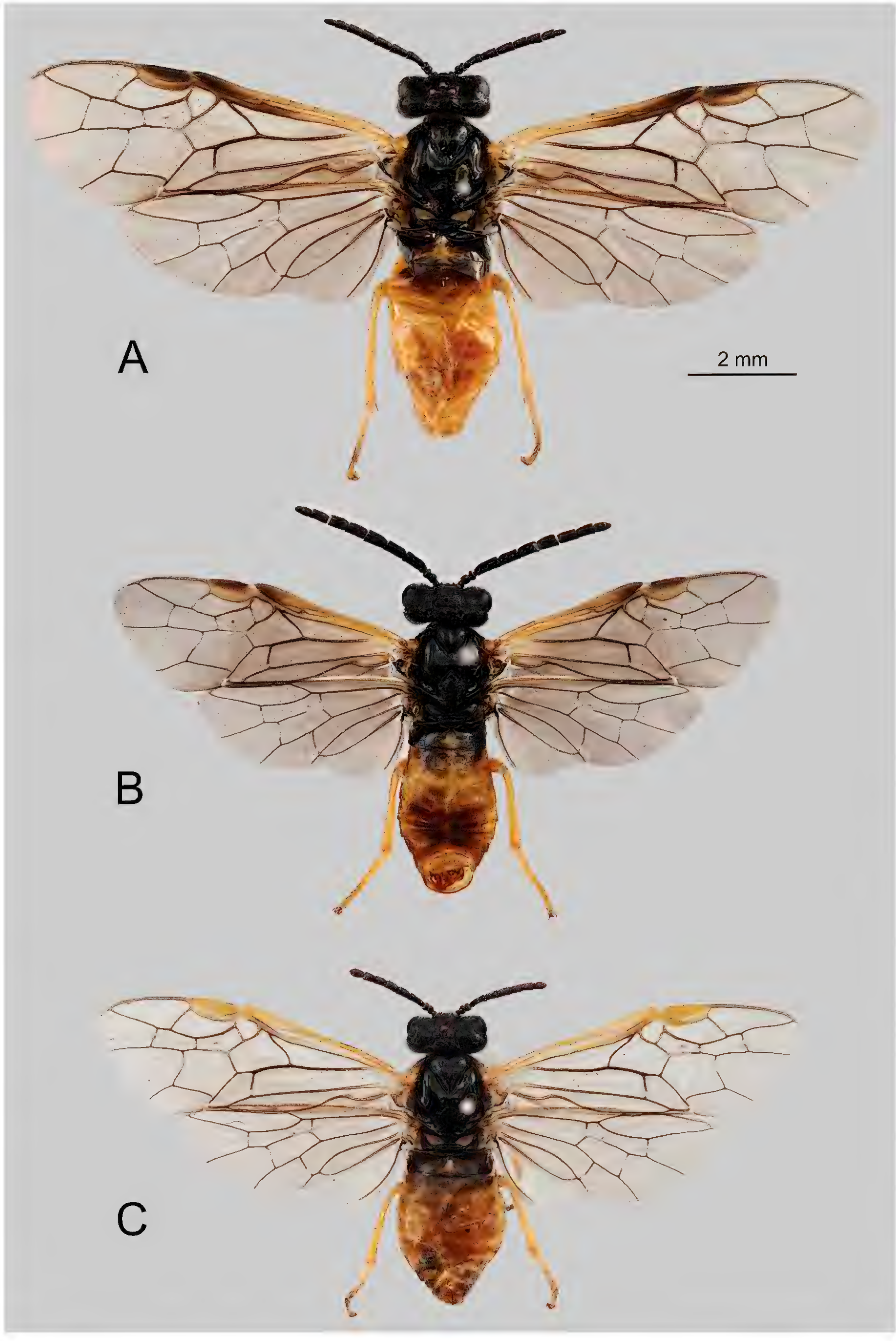

Figure 35. *Brachythops wuestneii* (Konow, 1885). **A.** ♀, normally colored form (ZMUO.036017); **B.** ♂, normally colored form (ZMUO.046083); **C.** ♀, high arctic form resembling the types of *Selandria flavistigma* Grönblom, 1939 (ZMUO.044636).

The taxonomy of *Strongylogaster macula* (Klug, 1817): a single species in Europe, or more? (Tenthredinidae, Selandriinae)

Macek (2010) proposed that in Europe two species have formerly been mixed up under the name *Strongylogaster macula*. He called them *S. macula* and *S. baikalensis* Naito, 1990 (Naito 1990). His opinion has since been followed by, for example, Lacourt (2020) and Mol (2021). Our own studies on about 200 specimens of *S. macula* from many Palaearctic localities initially suggested that three main, different morphotypes exist. All three appear to have a wide distribution in central and northern Europe. However, as we examined more specimens, it became increasingly difficult to clearly correlate the morphological traits with each other, or with available genetic data (only COI barcodes are so far available). Morphological characters which we examined were mainly: color pattern, surface sculpture, body size, penis valves and lancets. Possibly significant, but slight, variability in genitalic characters was observed, as previously by Macek (2010) and Mol (2021), but an inadequate number of specimens were dissected. The taxonomic content of the name *S. macula* requires further study, integrating morphological and genetic approaches. Such a study should ideally also include data on host plants, to test the assertions by Macek (2010) and Macek et al. (2020) that supposedly distinguishable morphotypes of *S. macula* use different genera of host plants. For the moment, we treat these forms as conspecific with *S. macula*. In northern Sweden, at several localities, M. Prous and A. Liston collected a large number of small, dark *S. macula* males and females on and around the fern *Gymnocarpium dryopteris* (L.) Newman. Later, at one of the sites, larvae were abundant on *G. dryopteris*, a host genus which has not previously been recorded for *S. macula*.

Species new to the Finnish sawfly fauna

Although the sawfly fauna of Finland is relatively well investigated compared to most other European countries, in recent years surprisingly many species have been found there for the first time. Paukkunen et al. (2020) have already mentioned some of these, but without any details. *Dolerus incisus*, *Phymatoceropsis sibiricola* and *Heptamelus viitasaarii*, discussed earlier in this paper, are also such cases. For some of the other more interesting species, we now present collection data, with brief commentaries on what is known about their wider distribution and biology.

Fenusa ewaldi D. R. Smith, 2011 (Tenthredinidae, Blennocampinae)

Figs 36–37

Notes. A total of about 40♀ and numerous mines. All specimens leg. M. Mutanen, in ZMUO and SDEI:

Finland: Ostrobottnia ouluensis, Oulu Linnanmaa kasvipuutarha [Oulu Botanic Garden], YKJ grid coordinates: 7219:3427 [65.064N, 25.460E]: adults, 26.06.2018.

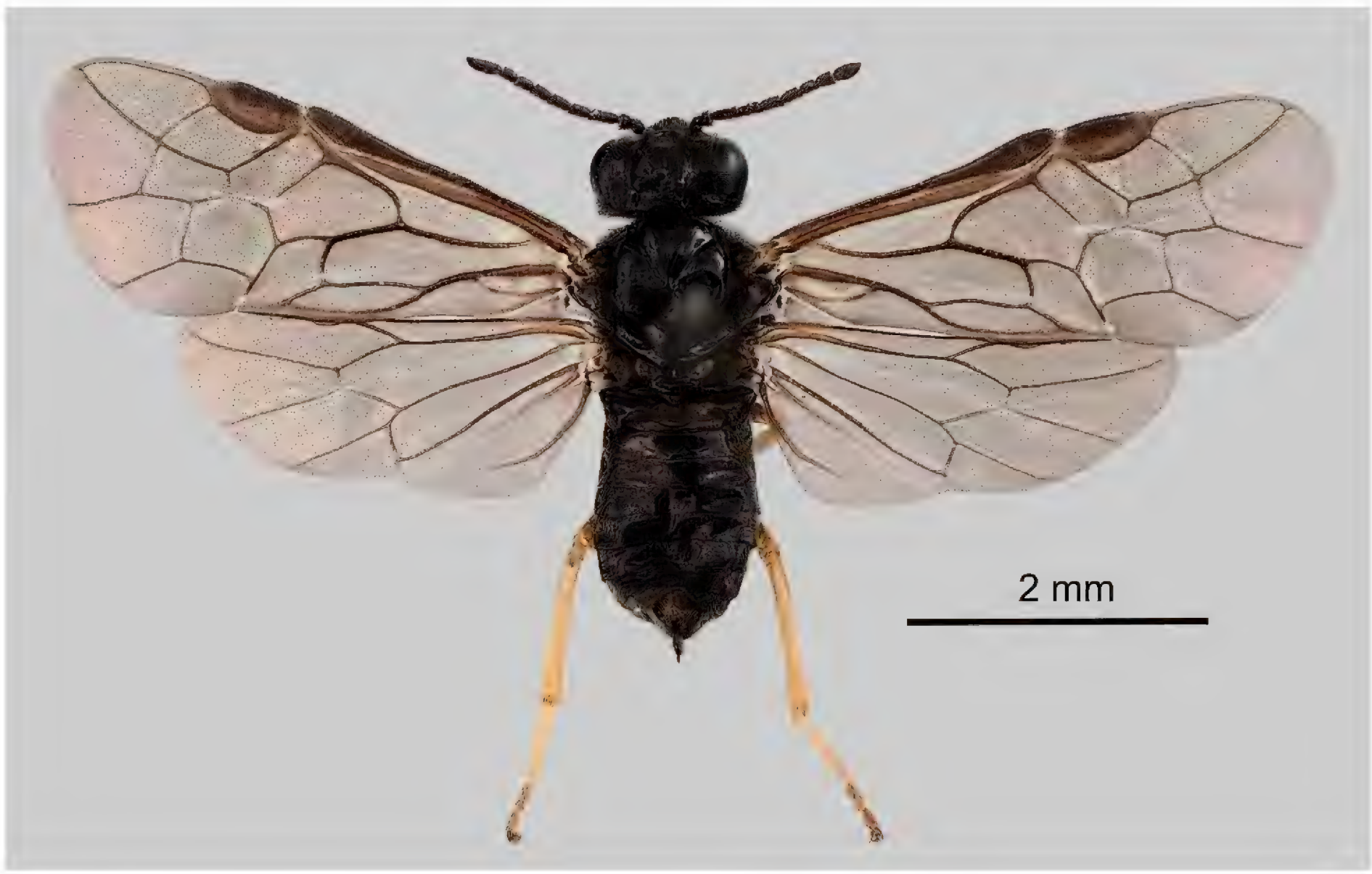

Figure 36. *Fenusa ewaldi* D. R. Smith, 2011. ♀ (ZMUO.045185).

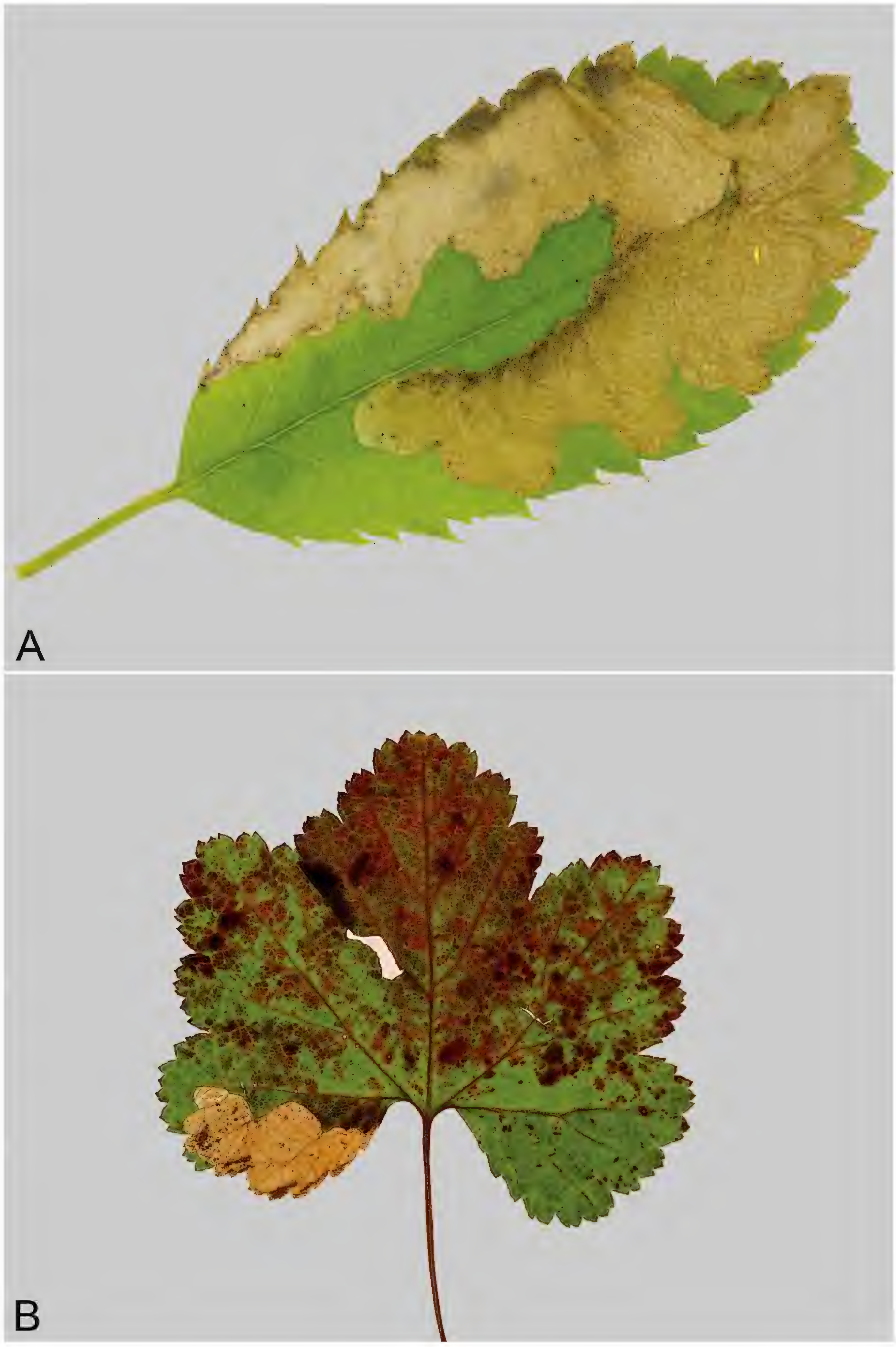

Figure 37. *Fenusa ewaldi* D. R. Smith, 2011. **A.** Leaf-mine in *Rosa* sp.; **B.** Leaf-mine in *Rubus chamaemorus*.

Larvae in mines on *Rosa*, 12.07.2019, Rearing 142/2019. Larvae in mines on *Rosa*, 07.08.2019, Rearing 376/2019. Adults, 06.06.2020. Larvae in mines on *Rosa*, 06.07.2020, Rearing: 30/2020.

Ostrobottnia kajanensis, Kuhmo Ulvinsalo, YKJ grid coordinates: 7103:3665 [63.992°N, 30.382°E]: about 20 mines on *Rubus chamaemorus*, of which ca 8 inhabited, with one larva in alcohol and four females emerged, collected 10.08.2019, Rearing: 400/2019.

Fenusa ewaldi was described from two females reared from leaf-mines on *Rosa* collected in Novosibirsk, West Siberia (Smith and Altenhofer 2011). Also reared from *Rosa* by Ponomarev (2022): Russia, Moscow oblast, Voynovo-Gora, 55.846°N, 39.063°E, 10.07.2020. Since at least 2018, leaf-mines of *Fenusa ewaldi* have been frequently found on *Rosa*, e.g. *R. woodsii* and *R. acicularis* in Oulu Botanic Garden, and numerous females reared (Fig. 36). At these three localities, cultivated *Rosa* species in parks and gardens were the hosts (Fig. 37A). Mines were found mostly on more sheltered rose bushes. The rearing of four females from leaf-mines on *Rubus chamaemorus* (above) was therefore unexpected, considering the habitat was shady, moist, natural old-growth mixed forest dominated by spruce (Fig. 37B).

Macrophya infumata Rohwer, 1925 (Tenthredinidae, Tenthredininae)

Fig. 38

Notes. Finland: Karelia borealis, Kitee: 1♂, Puhos [62.082°N, 29.935°E], 30.06.2017, leg. Juha Salokannel. 1♀, Pajarinmäki, 16.06.2020, YKJ grid coordinates: 68898:36667 [62.078°N, 30.191°E], leg. Jaakko Pohjoismäki and M. Mutanen. 3♂, Pajarinmäki, 18.06.2021, YKJ grid coordinates: 68898:36667 [62.078°N, 30.191°E], leg. A. Liston, M. Mutanen, N. Kiljunen, M. Prous. Approximately 30 larvae, on *Sambucus racemosa*, Pajarinmäki, 26.07.2021, YKJ grid coordinates: 68898:36667 [62.078°N, 30.191°E], leg. M. Mutanen and M. Prous. All specimens in ZMUO (Fig. 38).

In Europe previously recorded from the Russian regions of Kirov and Perm (Zhelochovtsev and Zinovjev 1996), but in iNaturalist (2022) more western Russian records are to be found (Kursk, Moscow, and St Peterburg Regions). The species is widespread in the East Palaearctic, from W. Siberia to Sakhalin, Japan, and northern China (Mallach 1936; Yoshida 2017). Host plant is *Sambucus racemosa*, including the closely related Japanese *S. sieboldiana* (Sakurai et al. 2009). The larvae were beaten from lower branches of *S. racemosa* in a shady habitat.

Stromboceros koebelei Rohwer, 1910 (Tenthredinidae, Selandriinae)

Fig. 39

Notes. Finland: Regio kuusamoensis, Kuusamo Uopajanpuro, YKJ grid coordinates: 7363:3613 [66.342°N, 29.534°E]: 1♂, 2♀, 13.06.2018, leg. Marko Mutanen. 4♂, 17.06.2019, leg. Iina Eskelinen and Riikka Jarkko. 15♂ [approximately], 1♀, 20.06.2020, leg. Marko Mutanen. All specimens in ZMUO.

The only previous records in the West Palaearctic were from Russia: Zhelochovtsev (1951) mentioned Archangelsk oblast, "Molotowsk" [since 1956 Severodvinsk], and Ermolenko (1975) wrote [translated] "distributed from Perm and the Urals to Sakhalin and Japan". Zhelochovtsev and Zinovjev (1996) mentioned only "Ural" as the area of occurrence within European Russia. Without locating voucher specimens, it is therefore impossible to decide whether the published distributional information for European Russia is accurate. *Stromboceros koebelei* occurs in the Russian Far East and Amur Region, but records are lacking from more western parts of the Russian East Palaearctic territories (Zhelochovtsev and Zinovjev 1996). It is also widespread in Japan, and occurs on the Korean Peninsula (Yoshida 2017). In Japan, species of *Athyrium* (Isaka et al. 2015), *Dryopteris*, and *Polystichum* (Naito 1979) have been recorded as host plants. The only known Finnish site for the species is a shady creek valley with mixed trees and rich vegetation. All specimens were swept from *Dryopteris expansa* (C. Presl) Fraser-Jenk. and Jermy, which is almost certainly the food plant at this site. Other fern species present on the site, including *Matteucia struthiopteris*, did not yield any adults. It is noticeable that all specimens from several other localities in the same region have turned out to represent the common *S. delicatulus*, suggesting that *S. koebelei* is very local and possibly has a narrow host range.

Discussion

Our taxonomic results include name changes of species which are widely distributed and frequently recorded in the West Palaearctic. Where the name which we now consider to be valid has not been in recent use and the name previously used is no longer employed as valid for a different taxon, such changes are relatively unproblematic. An example are the names *Dolerus junci* and *D. cothurnatus*. More problematic are cases where a species name continues to be used as valid, but is applied to a different taxon, e.g. *Abia nitens*. The change in use of the names *Dolerus coracinus* and *D. anthracinus* is close to the "worst case": both names continue to be valid, but for taxa other than those to which they were formerly applied. Even for taxonomists specialising on the group, such changes are confusing. However, although highly regrettable, these changes are a necessary consequence of adherence to the International Code of Zoological Nomenclature and the fundamental importance of name-bearing type specimens in defining the use of names. To avoid ambiguity resulting from the different applications of species names, we recommend that authors using these names should specify the work or works on which they base their taxonomy and nomenclature.

Many groups of sawflies are considered to be taxonomically "difficult", and this certainly applies to the West Palaearctic Cephidae. That we have discussed only one

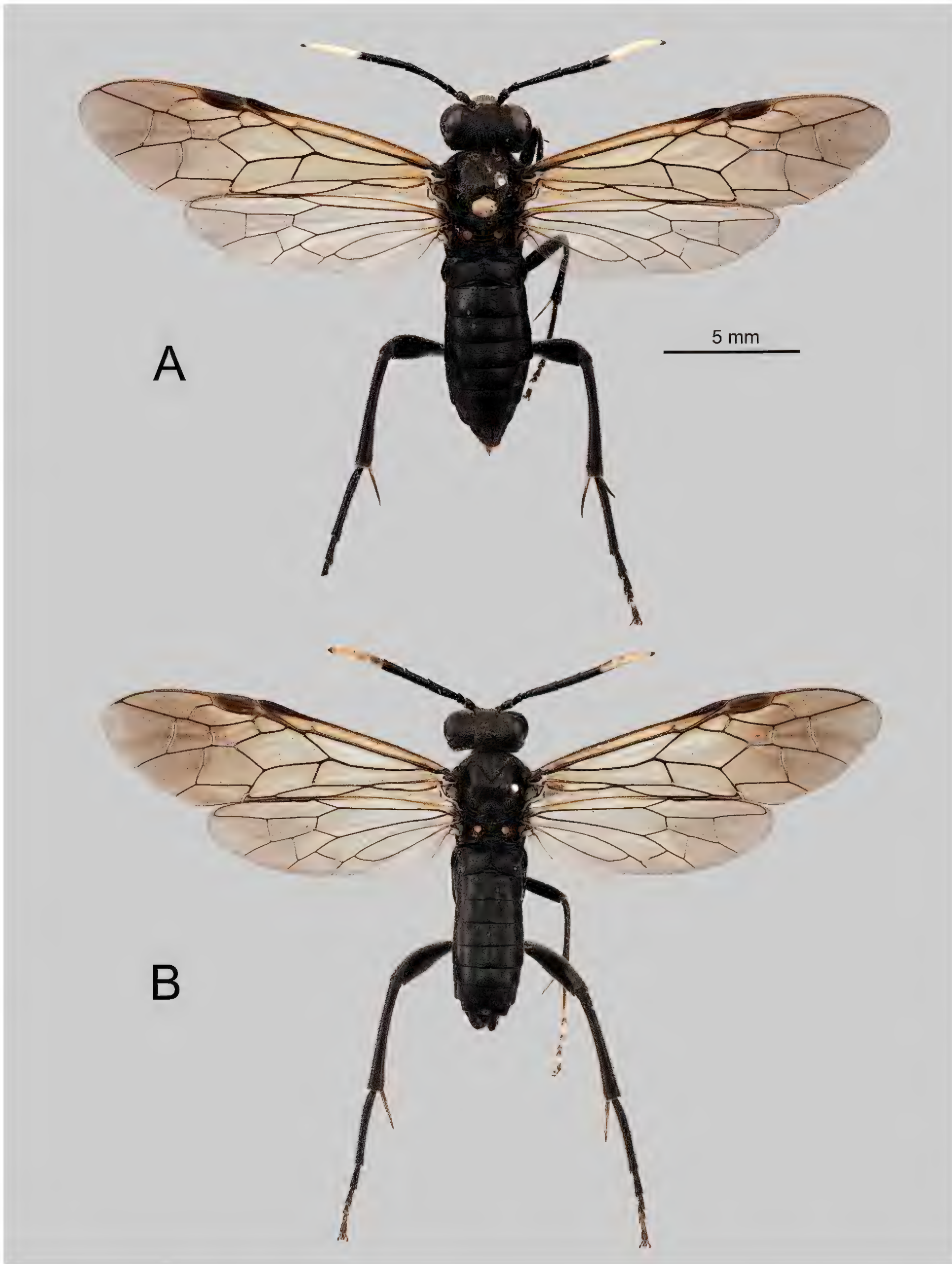

Figure 38. *Macrophya infumata* Rohwer, 1925. **A.** ♀ (ZMUO.046055); **B.** ♂ (ZMUO.060982).

taxonomic problem in this family is merely because relatively few species occur in northern Europe: the southern European species are even less well understood. However, the evidently unsatisfactory current circumscription of genera, at least in the Cephini, is a problem which affects the entire European fauna. In view of the economic importance of some Cephidae, it is surprising that they have not been better studied.

The temporal and geographical patterns of observations on *Fenusa ewaldi*, *Heptamelus viitasaarii*,

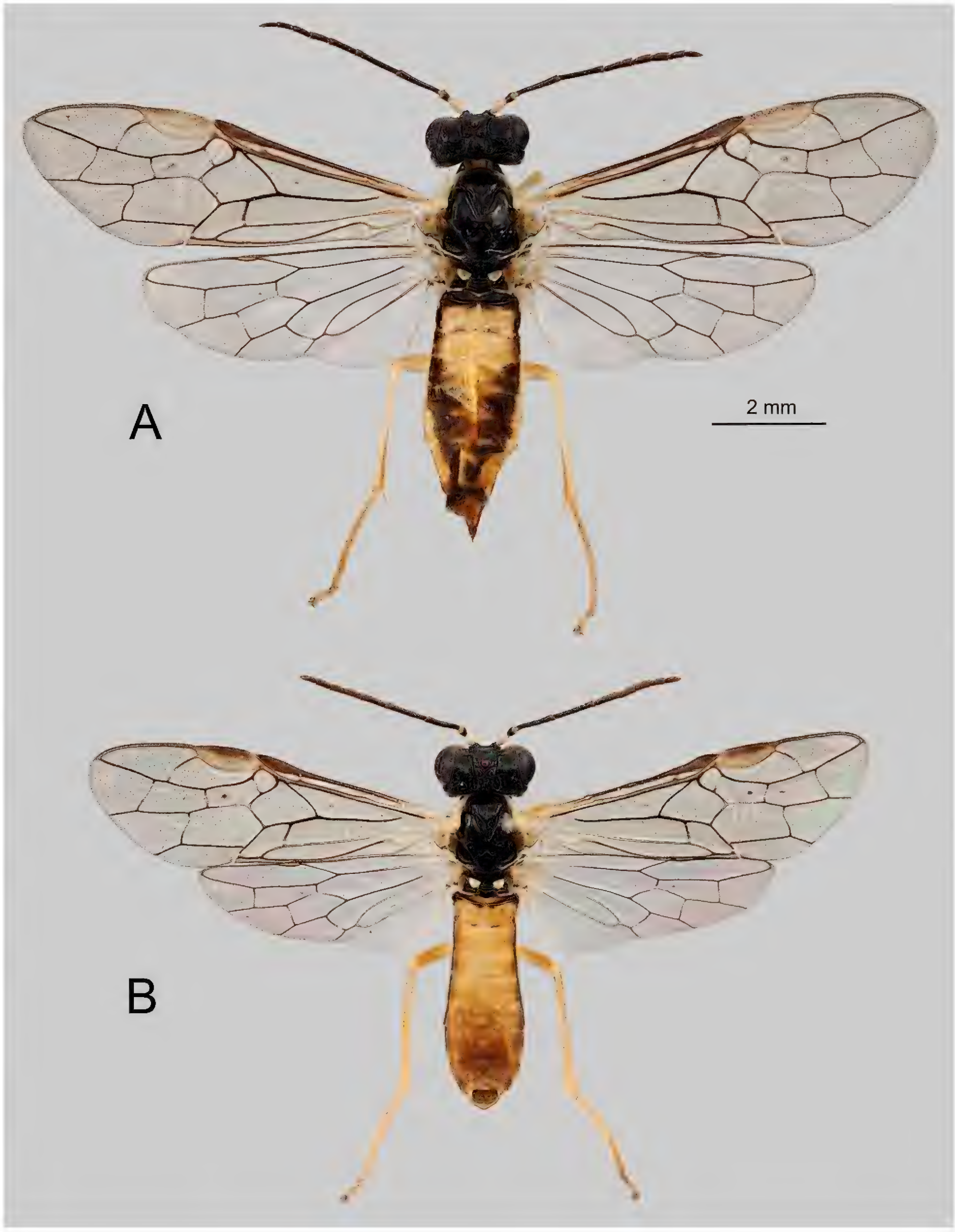

Figure 39. *Stromboceros koebelei* Rohwer, 1910. **A.** ♀ (ZMUO.045225); **B.** ♂ (ZMUO.045223).

Macrophya infumata, and *Phymatoceropsis sibiricola* suggest that these species have recently spread to Finland from the East. There may well be a connection between the increasing abundance of *Sambucus racemosa* in Finland during the past hundred years (Lempiäinen 1992), and the spread of two of the sawfly species which use it as their host: *M. infumata* and *P. sibiricola*. On the other hand, *Dolerus incisus* and *Stromboceros koebelei* may simply have been hitherto overlooked in Fennoscandia. In the case of *D. incisus*, which is morphologically similar to related species, it would not be surprising if it had been overlooked, but *S. koebelei* is considerably more easily

recognized, and therefore it perhaps really has a highly disjunct distribution in the West Palaearctic.

The host repertoire (Braga and Janz 2021) of *Fenusa ewaldi* is noteworthy on two counts. Firstly, it is unusual for a leaf-mining sawfly to develop on hosts belonging to more than one genus, although *Fenella nigrita* is considered to be an exception (Macek et al. 2020). Secondly, *F. ewaldi* is the first leaf-mining sawfly recorded from *Rubus chamaemorus*. Larvae of four other sawfly species have been found to feed to *R. chamaemorus* in Europe (unpublished data in SDEI database), but none of these is a monophage.

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Supplementary material 1

Taxonomy and nomenclature of some Fennoscandian Sawflies, with descriptions of two new species (Hymenoptera, Symphyta): studied specimens

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Data type: specimen data

Explanation note: Specimen data, GenBank accession numbers, and BOLD Process IDs of the relevant studied specimens.

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